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GRAPHOPHONE PATENTS
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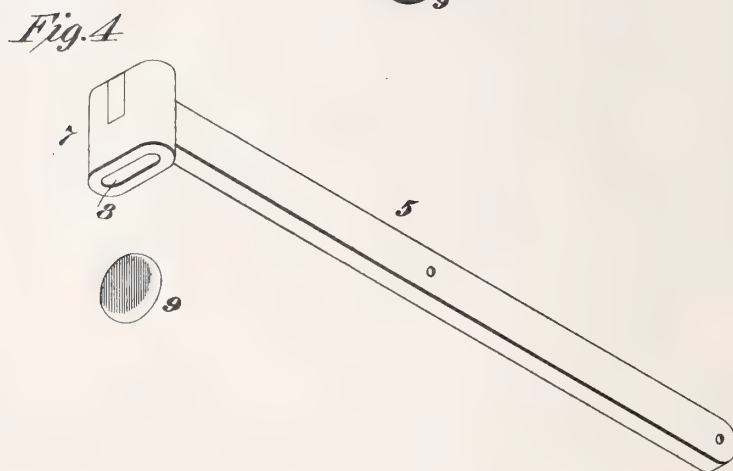
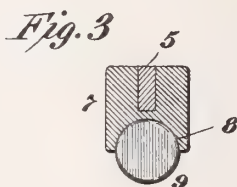
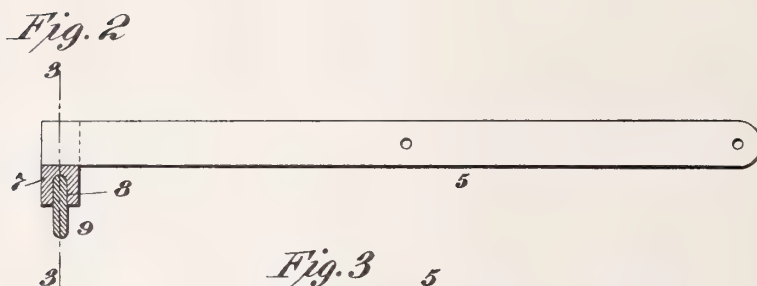
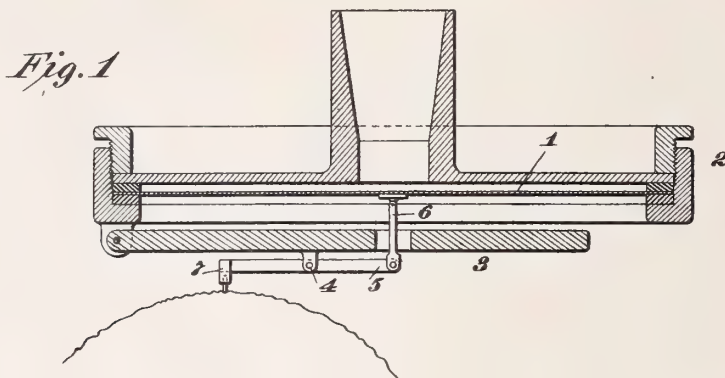
No. 655,480.

Patented Aug. 7, 1900.

T. A. EDISON.
PHONOGRAPHIC REPRODUCING DEVICE.

(Application filed May 3, 1900.)

(No Model.)



Witnesses:

Jas. F. Coleman
Archibald G. Rice

Inventor

Thomas A. Edison
J. L. Edmonds & Co.
Att'ys.

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

PHONOGRAPHIC REPRODUCING DEVICE.

SPECIFICATION forming part of Letters Patent No. 655,480, dated August 7, 1900.

Application filed May 3, 1900. Serial No. 15,351. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, a citizen of the United States, residing at Llewellyn Park, in the county of Essex and State of New Jersey, have invented a certain new and useful Improvement in Phonographic Reproducing Devices, (Case No. 1,034,) of which the following is a specification.

My present invention relates to improvements in reproducing devices for phonographs and allied talking-machines of the type heretofore invented by me and described and claimed in my application for patent filed September 21, 1899, Serial No. 731,138. The phonographic reproducers of the type in question are adapted for the more accurate tracking of the record than the usual spherical reproducers, and particularly for the tracking of records which are characterized, in part at least, by the formation of waves representing the fundamental tones and principal overtones and which may be of greater width than length, the particular form of such waves obviously preventing the accurate engagement therewith of the spherical reproducer.

My present invention consists in a reproducing device which is especially adapted for the reproduction from records made by a recording-tool having a curved cutting edge, and the present reproducer is therefore made of a form to properly engage the curve of the side walls of the record, while in its longitudinal dimension it presents a curve of less radius.

The object of my present invention is to provide a phonographic reproducer of this type which can be constructed very cheaply, which shall be effective in operation, and wherein in the preferred form fresh engaging surfaces can be presented for operation in case of wear. To this end my present reproducer comprises generally a disk or part of a disk having a rounded engaging edge which bears upon the record, with its transverse curve adapted for the accurate engagement with the side walls of the record and with its longitudinal curve sufficiently reduced as to allow for its proper engagement with substantially all the waves of the record representing at least the fundamental tones and the principal overtones.

Assuming my present reproducer to be used for reproducing from a record made with a recorder having a curved cutting edge, the invention in its preferred form comprises a disk of a radius slightly less than the curve of the recorder, the disk being rounded on its circumference, so that a portion thereof may engage the record, the radius of the longitudinal curve of the periphery of the disk being made small enough to properly engage all portions of the record representing at least the fundamental tones and the principal overtones without undue wear of the recording-surface, said disk being carried in any suitable way within a curved slot cut in a small head, which latter is secured to or connected with the reproducer-diaphragm, whereby the position of the disk within said slot may be shifted to present a fresh surface to the record when desired.

In order that my invention may be better understood, attention is directed to the accompanying drawings, forming a part of this specification, and in which—

Figure 1 is an enlarged sectional view showing the preferred form of my invention applied to a reproducer-diaphragm through a floating weight in the usual way; Fig. 2, a sectional view, on an enlarged scale, of the lever, the head, and the reproducing-disk; Fig. 3, a section on the line 3 3 of Fig. 2, and Fig. 4 a perspective view representing the parts of Fig. 2 separated from each other.

In all of the above views corresponding parts are represented by the same numerals of reference.

1 represents a reproducer-diaphragm carried in the usual frame 2, and 3 a pivoted floating weight carrying a fulcrum 4 for the reproducer-lever 5, the free end of which is connected to the diaphragm 1 by a link 6, all as is common in the art. Secured to the end of the lever 5 in any suitable way is a head 7, which may be slotted at its top for the reception of the end of said lever, as shown. The under surface of the head 7 is formed with a curved slot 8 therein, which may be made in a milling-machine, and mounted in said slot is a disk 9, which is the reproducing device proper. Instead of employing a complete disk the reproducing device may comprise any desired part of a disk. Preferably

a complete disk is employed, which is secured in place within the slot 8 in any suitable way, as by means of shellac, the advantage of this construction being that the disk may be
 5 turned around to present a fresh engaging surface when worn. The employment of a complete disk also enables the device to be easily constructed by cutting sections from a cylinder. The material of which the disk 9
 10 is formed may be any suitable refractory substance, preferably sapphire. The curve of the disk 9 transversely to the record is preferably somewhat less than the curve of the recording device, so that the disk will
 15 properly engage the side walls of the record-groove—that is to say, if the recording device is .035 of an inch in diameter the diameter of the disk may conveniently vary between .025 and .030 of an inch. In other words, assum-
 20 ing the width of the record-groove to be of the standard—namely, .01 of an inch—the diameter of the reproducer-disk may vary from two and one-half to three times that dimension. The bottom edge of the disk is rounded,
 25 as shown, with a curve which presents longitudinally to the record a smaller radius than the transverse curve, whereby the reproducing device will engage and accurately track a wave which may be of less length than
 30 width. This longitudinal curve may be made obviously less when very hard records are used than when the records are relatively soft; but in no case should it be made small enough as to result in undue wear of the rec-
 35 ord-surface.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is as follows:

1. In phonographs and allied talking-ma-
 40 chines, the combination with the diaphragm, of a reproducer connected therewith and comprising a disk-like body which presents transversely to the record a curve substantially coincident with that of the record-groove and
 45 longitudinally of the record a curve of less radius, substantially as set forth.

2. In a phonographic reproducer, the combination with the reproducer-diaphragm, of a reproducing device connected therewith, of

substantially the same thickness throughout, 50
 and presenting transversely to the record a curve substantially coincident with that of the record-groove and longitudinally of the record a curve of smaller radius, substantially
 55 as set forth.

3. In a phonographic reproducer, the combination with a reproducer-diaphragm, of a disk connected to the diaphragm and having a rounded engaging surface, substantially as
 60 set forth.

4. In a phonographic reproducer, the combination with a reproducer-diaphragm, of a disk connected to the diaphragm and having a rounded engaging surface, and means for
 65 shifting the position of said disk with respect to its center, substantially as set forth.

5. In a phonographic reproducer, the combination with a reproducer-diaphragm and a head connected to said diaphragm, of a disk-
 70 like reproducing device carried by said head and presenting a rounded engaging surface, substantially as set forth.

6. In a phonographic reproducer, the combination with a reproducer-diaphragm and a head connected to said diaphragm, of a disk-
 75 like reproducing device carried by said head and presenting a rounded engaging surface, and means for shifting the position of said reproducing device within said head, substan-
 80 tially as set forth.

7. As a new article of manufacture, a reproducing device made in the form of a disk having a rounded engaging surface and of a diameter approximately three times the width
 85 of the record-groove, substantially as set forth.

8. As a new article of manufacture, a reproducing device made of sapphire in the form of a disk having a rounded engaging surface, and of a diameter approximately three
 90 times the width of the record-groove, substantially as set forth.

This specification signed and witnessed this 30th day of April, 1900.

THOMAS A. EDISON.

Witnesses:

J. F. RANDOLPH,
 FRANK L. DYER.

No. 655,556.

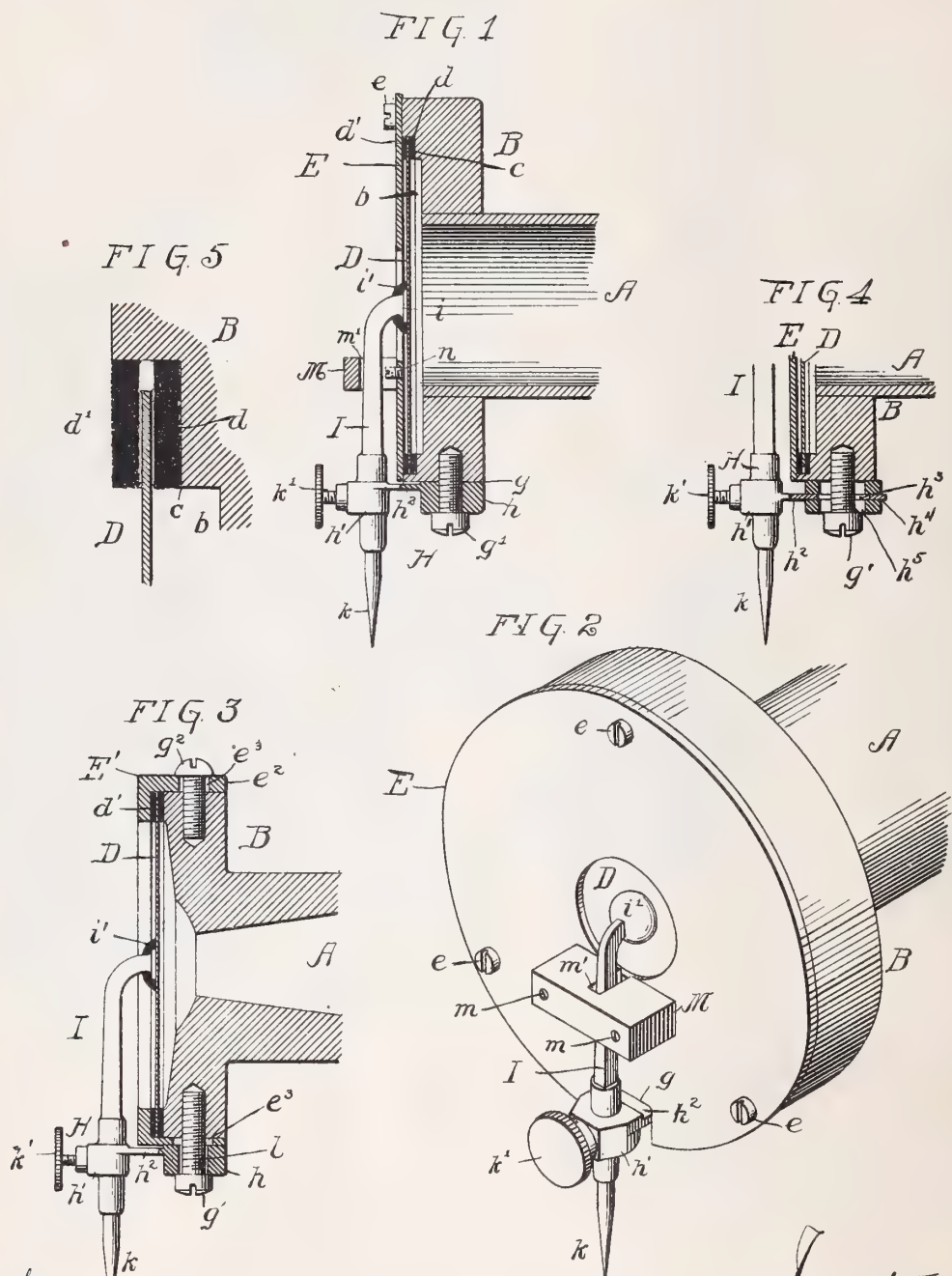
Patented Aug. 7, 1900.

E. R. JOHNSON.

SOUND RECORDING AND REPRODUCING MACHINE.

(Application filed June 1, 1897.)

(No Model.)



Witnesses:
John E. Parker
Burkholder.

Inventor
Eldridge R. Johnson
By his Attorney
1 Am. Pat.

UNITED STATES PATENT OFFICE.

ELDRIDGE R. JOHNSON, OF CAMDEN, NEW JERSEY, ASSIGNOR, BY MESNE ASSIGNMENTS, OF ONE-HALF TO THOMAS S. PARVIN, OF PHILADELPHIA, PENNSYLVANIA.

SOUND RECORDING AND REPRODUCING MACHINE.

SPECIFICATION forming part of Letters Patent No. 655,556, dated August 7, 1900.

Application filed June 1, 1897. Serial No. 639,028. (No model.)

To all whom it may concern:

Be it known that I, ELDRIDGE R. JOHNSON, a citizen of the United States, and a resident of Camden, State of New Jersey, have invented certain new and useful Improvements in Sound Recording and Reproducing Machines; and I do hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawings, forming part of this specification.

My invention relates to certain improvements in sound recording and reproducing machines, and has for its object to improve and simplify the construction of the recording and reproducing mechanism commonly known as the "sound-box," as more fully set forth hereinafter.

In the accompanying drawings, Figure 1 is an elevation, partly in section, of the sound-box constructed in accordance with my invention. Fig. 2 is a perspective view of the same. Fig. 3 is a view similar to Fig. 1, illustrating a modification of the structure to permit the adjustment of the rubber rings or gaskets in their relation to the diaphragm. Fig. 4 is a similar view illustrating a further modification, and Fig. 5 is an exaggerated sectional diagram illustrating the diaphragm and the adjacent rubber rings.

To produce the best results, the diaphragm and the stylus-bar should be so connected that either will instantly yield to the movement of the other; but the connection between the two and the mounting of each must be such that while one will instantly respond to the vibration of the other no checking of the vibration will be possible and all impulses tending to move one or the other beyond the proper limit will be avoided.

To obtain the best results and to secure from the full surface of the diaphragm the full force and effect of the sound-waves, the diaphragm at the periphery should be practically free. Further, where the fulcrum-point of the stylus-bar tends in operation by reason of the construction to yield in any appreciable degree the diaphragm should be sufficiently loose at the edges to allow the plane of the diaphragm to accommodate itself to the

changing fulcrum-point. A further difficulty found in the ordinary machines is that no allowance is made for the shifting movement of the diaphragm in its casing. Where no such movement is provided for, in cases where the stylus-bar is attached at one end to the center of the diaphragm a slight jar laterally upon the stylus will tend to break the connection between the stylus and the diaphragm. Provision for the lateral movement tends to obviate this. To remedy these defects, and, further, to provide for the adjustment of the various parts for the recording and reproduction of sound-waves of varying intensity are the principal objects of my invention.

Referring to the drawings, A represents the tubular section of the diaphragm-supporting frame connected at one end to a recessed diaphragm-holding disk B, and at its opposite end leading and connected directly or indirectly to a mouthpiece, trumpet, or similar sound-conveying device. In the front face of the disk B is formed a recess *b*, having a step or flange *c*, on which is placed a ring or gasket *d*, of rubber or other suitable yielding material, for the reception and support of the diaphragm D. On the outer face of the diaphragm is placed a second rubber ring *d'*, the latter being confined in place by a disk E, secured by screws *e* to the recessed disk B. It is to be noted that the edge of the diaphragm is, as shown more clearly in Fig. 5, preferably at a slight distance from the adjacent circular portion of the wall of the recess *b*. In other words, the diameter of the diaphragm is preferably slightly less than the diameter of the recess formed in the casing.

In a recess *g*, formed in the peripheries of the disks B and E, is fitted the stylus-bar holder or spring-support H, preferably reduced at about midway of its length, comprising two block-like portions *h h'*, connected by a plate *h²*, the distance between the blocks and the thickness and width of the plate *h²* governing the freedom of movement of the stylus-bar I. The support H is secured to the disk B by a screw *g'*, as illustrated in Figs. 1 and 4. It is clear that the plate *h²* may be

integral with the block-like portion h or they may consist of two separate parts, being secured to the disk B by the screw g' . The enlargement of the orifice in the block h and plate portion h^2 , through which the screw g' passes, will obviously permit of a slight lateral adjustment of these parts. In Fig. 1 the orifice through which the screw g' passes is not shown as enlarged. In Fig. 3 it is shown slightly enlarged, which will permit of a slight adjustment. In Fig. 4 the orifice through which the screw g' passes is shown as considerably enlarged to permit of a more-extended adjustment.

15 The stylus-bar I is rigidly secured to or is formed integral with the block h' of the support H and at one end is recessed for the reception of a stylus or needle k , which is held in position by a set-screw k' . It is clear that as the stylus-point or needle k is provided in a longitudinally-disposed recess or bore in the lower end of the stylus-bar, as illustrated in the drawings, and is held in position by the set-screw k' , the said needle-point k may be adjusted in said stylus-bar so as to be lengthened or shortened relatively to the stylus-bar, limited only by the length of the needle and the length of the bore, which practically permits of the arm being lengthened or shortened to any desirable extent. The opposite end of the bar is turned at an angle to its length and has a slightly-enlarged head i , which is phonetically connected to the diaphragm and is preferably secured by a slightly-elastic cement i' . In adjusting the stylus-bar to the diaphragm much care must be taken to prevent even the slightest pressure upon either the diaphragm or the bar. The two must be so connected that both will yield and each respond to the movement of the other, but neither be under the slightest strain or tension. To accomplish this, the head i of the stylus-bar is allowed to come into contact with the center of the diaphragm after the latter has been carefully adjusted, and the head is then slightly raised out of contact with the diaphragm—say to the extent of about one one-thousandth of an inch—and the cement is placed or poured around the head of the bar, and, if necessary, heat is employed to melt the cement and firmly unite the two pieces to each other.

At a suitable point in the length of the stylus-bar is a guard M, secured by screws m to the face of the disk E and having at its center a slot m' , through which passes the stylus-bar I, the distance between the side and bottom walls of the slot and the sides of the stylus-bar being about one one-hundredth of an inch, so that lateral movement of the stylus-bar to any greater extent than this is absolutely prevented. The vibration of the diaphragm beyond the normal limits is prevented in one direction by the bottom wall of the slot m' and in the opposite direction by an adjustable stop-screw n , screwing into the disk E at a point within the slot and immediately under the stylus-bar.

To obtain the best results and to reproduce pure and musical notes loud, distinct, and clear, the diaphragm should move as a whole in both recording and reproducing and not be rigidly confined at its peripheries in such a manner as to make it simply a round spring in which the vibratory movement is greatest at the stylus contact or the center. This purely-center vibration is a great disadvantage in both recording and reproducing. As the recording is caused by the sound-wave's action on the surface of the diaphragm, it is clear that if the whole surface responds to the action of the waves it will give a much more powerful movement to the stylus-bar, thereby assisting to make a more perfect record, as it will to a much greater extent overcome the resistance to the stylus caused by friction or resistance in cutting or marking the record of the sound-waves. To provide for this free movement of the diaphragm, I preferably construct the holding devices in the manner shown in Fig. 3, in which a flanged ring E' takes the place of the disk E, the annular flange e^2 of said ring fitting over the periphery of the disk B and being provided with slots e^3 , through which pass holding-screws g^2 to properly adjust the gaskets in the casing to their proper position relative to the diaphragm. In this construction it is desirable that the block h of the stylus-support H be slotted, as shown at l , so that the stylus-support and the stylus may be adjusted with the diaphragm in order to prevent any straining or tension on one or the other.

In Fig. 5 I have illustrated on an exaggerated scale a cross-section of the rubber rings or gaskets and diaphragm, showing the naturally-rough surface of the rubber rings. These rings should be of less thickness than the distance between the respective adjacent faces of the inclosing casing and the respective faces of the diaphragm when in its normal position. It is clear that the construction should be such, as far as the relation of the gaskets and the diaphragm is concerned, that the gaskets shall not interfere with the free vibratory movement of the diaphragm approximately evenly throughout its entire area, though the degree of proximity may vary within these limitations.

The construction of the stylus-support illustrated in Fig. 1 is one adapted for ordinary purposes, the length and thickness of the plate h^2 being sufficient to check excessive vibration, while at the same time it permits perfect freedom of movement to the stylus-bar and increases the sensitiveness of the device. Where, however, the instrument is employed for the reproduction of extremely-large vibratory waves, the length of the plate h^2 would be materially shortened, as in such case the greater tendency to excessive vibration must be overcome. For notes where the tendency to excessive vibration is much smaller the length of the plate may be materially increased. To accomplish this adjustment, I

prefer to employ the construction illustrated in Fig. 4, in which the block h' is made integral with the plate h^2 , the latter being of considerable length and slotted at h^3 for the passage of the securing-screw g' . The plate h^2 passes through a slot h^4 , formed in the center of the block h , which latter is also provided with a slot h^5 in line with the slot h^3 for the passage of the securing-screw g' . In adjustment for the lower or higher notes the relative positions of the stylus-bar and diaphragm should not be altered, and the plate h^2 therefore remains in the same position at all times, while the slotted block h is moved toward and from the block h' , so as to decrease or increase the length* of the plate between the adjacent edges of the blocks h and h' and then firmly secured in position to bind the plate, the effect being substantially the same as though the block h were formed integral with such plate. It is clear, however, that the plate h^2 , having the elongated slot h^3 , as shown in Fig. 4, may, if desired, be also laterally adjusted in the block h to accomplish the same purpose, though the former adjustment is preferable.

I have herein described a preferable construction of spring for mounting the stylus-bar, but do not limit myself to the form described, as other forms may be employed without departing from my invention as claimed; nor is it absolutely necessary to the successful operation of the loosely-mounted diaphragm that the spring-mounting of the stylus shall be adjustably secured upon the sound-box, though it is preferable.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a sound recording and reproducing machine, a diaphragm mounted upon the stylus-bar having its periphery free from contact with the casing in which it is mounted to allow the diaphragm to vibrate substantially evenly throughout its entire area, and yielding rings arranged near the periphery of the diaphragm, said rings being so constructed and arranged as to permit of the free vibratory movement of the diaphragm at the portion adjacent to said rings substantially evenly throughout its entire area, said rings operating as retainers against abnormal displacement, substantially as described.

2. In a sound recording and reproducing machine, a spring-mounted stylus-bar, a diaphragm loosely mounted in its casing free to vibrate approximately evenly throughout its entire area carried at its central point upon the upper end of said stylus-bar, yielding rings arranged on either side of and near the periphery of the diaphragm to retain said diaphragm against abnormal displacement and arranged and adjusted so as not to interfere with the free vibratory movement of the diaphragm substantially evenly throughout its entire area as described.

3. In a sound recorder or reproducer, the

combination of a sound-box, a loose diaphragm free to vibrate at its periphery and loose gasket, substantially as described.

4. In a sound recording or reproducing machine, a spring-mounted stylus-bar, a diaphragm loosely mounted in its casing free to vibrate approximately evenly throughout its entire area, yielding rings arranged on either side of and near the periphery of the diaphragm to retain said diaphragm against abnormal displacement and arranged and adjusted so as not to interfere with the free vibratory movement of the diaphragm substantially evenly throughout its entire area as described.

5. In a sound recording or reproducing machine, the combination of a sound-box, a loosely-mounted diaphragm free to vibrate at its periphery, a retaining-gasket therefor, and a spring-mounted stylus phonetically connected with the said diaphragm, substantially as described.

6. In a sound recording or reproducing machine, the combination of the sound-box, a loosely-mounted diaphragm therein free to vibrate at its periphery, a stylus-bar supporting said diaphragm and gaskets sufficiently loose not to interfere with the free vibratory movement of the diaphragm at its periphery, substantially as described.

7. In a sound recording and reproducing machine, a loosely-mounted diaphragm carried at its central point upon a spring-supported stylus-bar, said stylus-bar being longitudinally bored at its lower end for the reception of the needle or stylus point, a thumb-screw provided in the lower end of said stylus-bar for securing and regulating the length of adjustment of the stylus-point in its relation to the main bar, a spring-plate rigidly secured to said stylus-bar intermediate of its length and to the casing of the sound-box, means for regulating the longitudinal adjustment of the said spring-plate, said spring-plate operating as a fulcrum for the stylus, the whole constructed to allow the loosely-mounted diaphragm to vibrate substantially evenly throughout its entire area from its central point, substantially as described.

8. In a sound recording and reproducing machine, the combination of the centrally-supported diaphragm loosely mounted in the sound-box casing, a spring-supported stylus-bar having one end thereof connected with the center of the diaphragm, and peripheral portions of the said diaphragm being freely and loosely mounted within the casing of the sound-box so as to allow said diaphragm to vibrate substantially evenly throughout its entire area, a yielding stylus-bar support secured to said casing and to said stylus-bar at opposite ends respectively, said support comprising a metallic spring-plate, rigidly secured at one end to the stylus-bar and at the other end adjustably mounted upon the sound-box, substantially as described.

9. A yielding stylus-bar support for sound

recording and reproducing machines comprising a metallic plate, h^2 , having an enlarged head or block, h' , adapted to be secured to the stylus-bar, the opposite end being adjustable upon the sound-box, said metallic plate, h^2 , being reduced in thickness to provide the requisite stiffness in the plate, substantially as described.

10. In a sound recording and reproducing machine, a diaphragm loosely mounted in the casing free to vibrate approximately evenly throughout its entire area, a stylus-bar carrying said diaphragm centrally upon the upper end of said bar, a spring-support for the stylus-bar comprising a thin spring-plate, h^2 , having an enlarged end portion, h' , rigidly secured upon the stylus-bar, an enlarged block portion, h , provided upon the opposite end of the spring-support integral with the plate, h^2 , and orifice, l , transversely provided through the portion, h , for the reception of and adjustment upon the securing and adjusting screw, g , for securing said support to the sound-box of the machine, substantially as described.

11. In a sound recording and reproducing machine, a sound-box casing, a loosely-mounted diaphragm provided therein, a stylus-bar attached to the said diaphragm at its upper end, yielding rings provided on either side of said diaphragm near the periphery thereof constructed and arranged to permit of the free vibratory movement of the diaphragm substantially evenly throughout its entire area operating as retainers against abnormal displacement of the diaphragm and adjustable flanged ring provided upon the upper side of the casing to regulate the adjustment of the said yielding rings in relation to the diaphragm, substantially as described.

12. In a sound recording and reproducing machine, a sound-box, a loosely-mounted diaphragm free to vibrate substantially evenly throughout its entire area, yielding material provided upon either side of the diaphragm near the periphery to retain the diaphragm against abnormal displacement and so as not to interfere with the free vibratory move-

ments at points adjacent to said yielding material and flanged cap E' , adjustably provided upon the sound-box to regulate the adjustment of the yielding material to the diaphragm and means for adjusting and securing said flanged cap upon said sound-box, substantially as described.

13. In a sound recording and reproducing machine, a sound-box casing, a spring-supported stylus, a diaphragm mounted in said casing at its central point upon the upper end of said stylus, a spring secured to said stylus and to the walls of the casing constituting a yielding support for said stylus, said diaphragm being of a diameter less than the diameter of the recess in said casing in which it is mounted to allow of play between the edges of the diaphragm and the circular walls of said recess, the faces of the said diaphragm near the periphery being loosely mounted to allow of full and free vibration, substantially as described.

14. In a sound recording and reproducing machine, a spring-mounting for the stylus-bar adjustable lengthwise upon the sound-box, said spring being secured at one end to the stylus-bar and at its opposite end upon the sound-box and an adjustable flanged retaining-ring adapted to the main frame of the sound-box adjustable thereon and means for holding the flanged ring in its adjusted positions, substantially as described.

15. In a sound-box, a casing, a loosely-mounted diaphragm therein free to vibrate approximately evenly throughout its entire area and a stylus-bar arranged substantially parallel to the face of the diaphragm yieldingly mounted upon the casing and having its upper end phonetically connected with the center of the diaphragm, substantially as described.

In witness whereof I have hereunto set my hand this 26th day of May, A. D. 1897.

ELDRIDGE R. JOHNSON.

Witnesses:

JNO. E. PARKER,
B. G. ROYAL.

No. 655,557.

Patented Aug. 7, 1900.

E. R. JOHNSON.
SOUND RECORDING AND REPRODUCING MACHINE.

(Application filed Aug. 23, 1898.)

(No Model.)

Fig. 1.

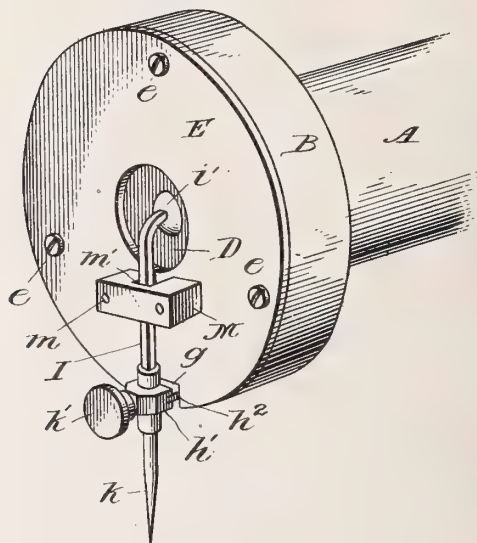


Fig. 2.

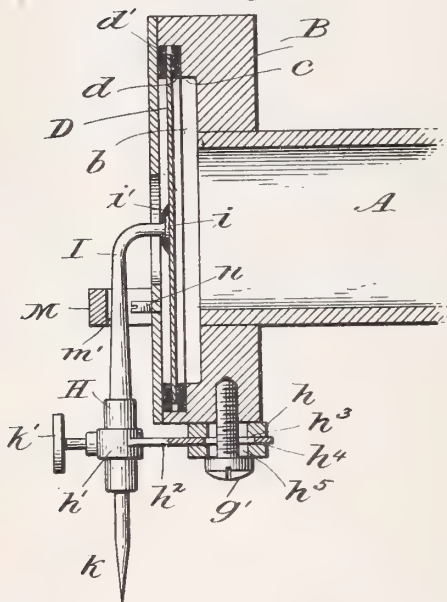
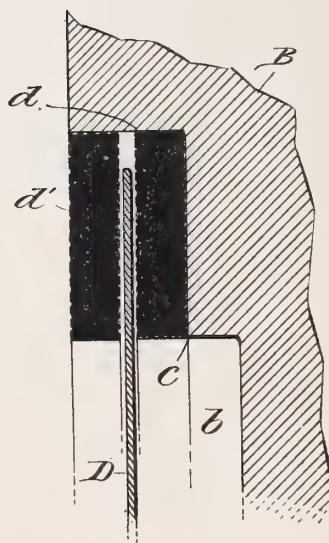


Fig. 3.



Witnesses
Jno. T. Cross
J. Henderson.

Inventor
Clarence R. Johnson;
by J. M. Pettis,
his Attorney.

UNITED STATES PATENT OFFICE.

ELDRIDGE R. JOHNSON, OF PHILADELPHIA, PENNSYLVANIA.

SOUND RECORDING AND REPRODUCING MACHINE.

SPECIFICATION forming part of Letters Patent No. 655,557, dated August 7, 1900.

Original application filed June 1, 1897, Serial No. 639,028. Divided and this application filed August 23, 1898. Serial No. 689,291. (No model.)

To all whom it may concern:

Be it known that I, ELDRIDGE R. JOHNSON, a citizen of the United States, and a resident of the city of Philadelphia, State of Pennsylvania, have invented certain new and useful Improvements in Sound Recording and Reproducing Machines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

My invention relates to certain improvements in sound recording and reproducing machines, and has for its object to simplify and improve the construction of what is commonly known as the "sound-box" and parts pertaining thereto, my present application being a division of application filed by me June 1, 1897, Serial No. 639,028.

In the accompanying drawings, Figure 1 is a perspective view of a sound recording and reproducing device constructed in accordance with my invention. Fig. 2 is a sectional view of Fig. 1. Fig. 3 is an exaggerated sectional diagram illustrating the diaphragm and the parts adjacent to its periphery.

Referring to the drawings, A represents the tubular section of the diaphragm-supporting frame connected at one end to a recessed diaphragm-holding disk B and at its opposite end leading and connected directly or indirectly to a mouthpiece, trumpet, or similar sound-conveying device. In the front face of the disk B is formed a recess *b*, having a step or flange *c*, on which is placed a ring *d*, of soft rubber or other suitable yielding material. In front of this ring the diaphragm D is adjusted in position, and on the outer face of the diaphragm, hardly or slightly in contact therewith, is placed a second similar ring *d'*, which is confined in place by the disk E, secured by screws *e*, as illustrated in Fig. 1, or by other suitable means to the recessed portion B.

It will be noted, as more clearly shown in Fig. 3, that the periphery of the diaphragm is out of contact with the inner peripheral walls of the recess, preferably to an extent of about four one-hundredths of an inch. It is also clear, as particularly illustrated in this figure, that the faces of the diaphragm near its periphery are practically out of obstructive con-

tact with the faces of the adjacent rubber rings, or the contact, if any, is so slight as not to prevent the diaphragm under the impulses of the sound-waves from vibrating practically evenly throughout its entire area.

In a recess *g*, formed in the peripheries of the disks B and E, is fitted the stylus-bar holder or spring-support H, having the spring-plate portion *h*², formed of the desired thickness and adapted to be secured at one end to the bar I. The spring-support H comprises the plate portion *h*² and may have adapted thereto the fixed block-like portion *h'* and the adjustable block *h*. The distance between the said blocks and thickness and width of the plate govern the freedom of movement of the stylus-bar I. The support H is secured to the disk B by any suitable means, such as that illustrated in Fig. 1 or in Fig. 2. The enlargement of the orifice in the plate portion *h*², through which the screw *g'* passes, will obviously permit of a slight lateral adjustment of the parts. In Fig. 1 the orifice through which the screw *g'* passes is preferably slightly enlarged, which will permit of slight adjustment. In Fig. 3 the orifice through which the screw *g'* passes is shown as considerably enlarged to permit a more extended adjustment.

Referring to Fig. 2, plate *h*² is of considerable length and slotted at *h*³ for the passage of the securing-screw *g'*. The plate *h*² passes through a slot *h*⁴, formed in the center of the block *h*, which latter is also provided with a slot *h*⁵, in line with the slot *h*³, for the passage of the securing-screw *g'*. In adjustment for the lower or higher notes the relative positions of the stylus-bar and diaphragm should not be altered, and the plate *h*² therefore remains in the same position at all times, while the slotted block *h* is moved toward and from the block *h'*, so as to decrease or increase the length of the plate between the adjacent edges of the blocks *h* *h'* and then firmly secured in position to bind the plate, the effect when adjusted being substantially the same as though the block *h* were formed integral with such plate. It is clear that the plate *h*², having the elongated slot *h*³, as shown in Fig. 2, may, if desired, be also adjusted lengthwise in the block *h* to accomplish the same purpose,

though the former adjustment is preferable. It is also clear that the block *h* may be omitted, if desired.

The stylus-bar I is rigidly secured to or is formed integral with the block *h'* of the support II and at one end is recessed for the reception of the stylus or needle *k*, which is held in position by a set-screw *k'*. The opposite end of the bar is turned at substantially a right angle to its length and has preferably a slightly-enlarged head *i*, which is connected to the diaphragm by a slightly-elastic cement *i'*. In adjusting the stylus-bar to the diaphragm considerable care should be exercised.

At a suitable point in the length of the stylus-bar is a guard M, secured by screws *m* to the flange or plate in front of the diaphragm and having at its center a slot *m'*, through which passes the stylus-bar I, the distance between the side and bottom walls of the slot and the sides of the stylus-bar being preferably about one one-hundredth of an inch, so that lateral movement of the stylus-bar to any greater extent than what is approximately the normal vibratory movement is prevented, and thus the bar is prevented from being torn from the diaphragm by an accidental knock or jar. The vibration of the diaphragm beyond the normal limits is prevented in one direction by the bottom wall of the slot *m'* and in the opposite direction by the adjustable stop-screw *n*, screwing into the disk E at a point within the slot and immediately under the stylus-bar.

I have discovered that to obtain the best results the diaphragm should move substantially as a whole in both recording and reproducing and not be rigidly confined at its peripheries in such a manner as to make it simply a round spring in which the vibratory movement is greatest at the center or point of contact with the stylus.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a sound recording and reproducing machine, a yielding stylus-bar support secured at one end to a fixed point and its opposite end to the stylus-bar, said support having an enlarged head at the point of connection with the stylus-bar, said yielding support being reduced in thickness throughout the remainder of its length to properly yield under the impulses of the sound-waves to retain the diaphragm in its normal position in the sound-box when at rest, and means for

adjusting said support upon said box, substantially as described.

2. In a sound recording and reproducing machine, a spring-plate stylus-bar support, *h*², an auxiliary adjustable block supporting said spring-plate on the sound-box, said block having a slot, *h'*, formed in the center thereof transversely for the reception of the plate, *h*², a securing-screw; *g'*, and an enlarged slot, *h*², provided vertically through said block to allow of lateral adjustment upon the securing-screw, substantially as described.

3. In a sound recording and reproducing machine, the combination of the diaphragm-supporting case, a diaphragm therein, a stylus-bar secured at one end to the center of the diaphragm, a slotted guard fitting over said stylus-bar, an adjustable set-screw projecting from the diaphragm-case immediately under the stylus-bar, said set-screw and guard being adapted to limit the range of vibratory and lateral movement of said stylus-bar.

4. The combination of the diaphragm-support provided with a recess for the reception of the diaphragm, a diaphragm of a diameter less than the diameter of the recess, a stylus-bar having one end secured to the center of said diaphragm, and a slotted guard fitting around said stylus-bar and adapted to limit the range of movement of said stylus-bar.

5. In a sound recording and reproducing machine, the combination of the diaphragm-supporting case, a diaphragm therein, disk, E, a stylus-bar secured at one end to the center of the diaphragm, and a slotted guard, M, secured upon the disk, E, having a central slot, *m'*, adapted to the passage of the stylus-bar and to limit abnormal movement of the stylus-bar, substantially as described.

6. In a sound recording and reproducing machine, a yielding stylus-bar support secured at one end to a fixed point and its opposite end to the stylus-bar, said support having an enlarged head at the point of connection with the stylus-bar, said yielding support being reduced in thickness throughout the remainder of its length to properly yield under the impulses of the sound-waves to retain the diaphragm in its normal position in the sound-box when at rest, substantially as described.

In witness whereof I have hereunto set my hand this 12th day of August, A. D. 1898.

ELDRIDGE R. JOHNSON.

Witnesses:

HORACE PETTIT,
BENJ. F. PERKINS.

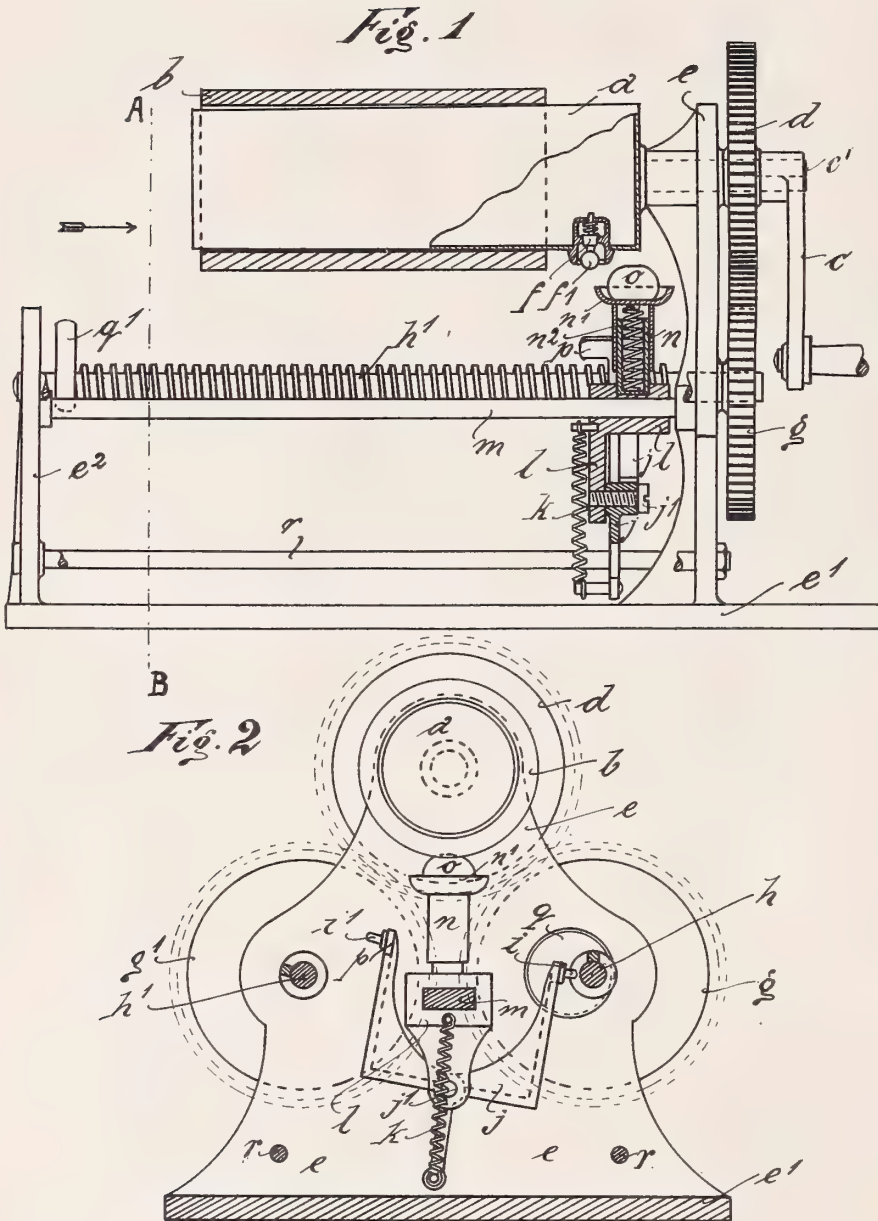
No. 656,366.

Patented Aug. 21, 1900.

R. NELLES.
PHONOGRAPH ERASING DEVICE.

(Application filed Jan. 22, 1900.)

(No Model.)



Witnesses

J. L. Johnson.

G. S. Noble

Inventor,
Rudolf Nelles
by T. J. Singer.
Att'y.

UNITED STATES PATENT OFFICE.

RUDOLF NELLES, OF HAMBURG, GERMANY.

PHONOGRAPH ERASING DEVICE.

SPECIFICATION forming part of Letters Patent No. 656,366, dated August 21, 1900.

Application filed January 22, 1900. Serial No. 2,347. (No model.)

To all whom it may concern:

Be it known that I, RUDOLF NELLES, chief steward, a subject of the German Emperor, residing at 48 Pferdemarkt, Hamburg, in the German Empire, have invented new and useful Improvements in Devices for Renovating Phonograph Record-Cylinders and the Like, (for which I have made applications for patents in Germany, filed December 19, 1899, and in Great Britain, filed January 2, 1900,) of which the following is a specification.

This invention relates to an improved device by means of which impressions made upon the outer surface of phonograph-cylinders by the receiving or recording stylus may be effaced and the cylinder rendered fit for the reception of a fresh record.

In order that my invention may be readily understood and carried into effect, I will describe the same more fully with reference to the accompanying drawings, in which—

Figure 1 is a side elevation of my improved device partly in section, the front spindle *h* being omitted; and Fig. 2 is an end elevation of the same, partly in section, taken upon the line A B of Fig. 1.

a designates a conically-formed cylinder serving for the reception of the phonograph record-cylinder *b*, which latter usually consists of a composition of wax and resin or the like. This conical cylinder *a* is caused to rotate by means of a handle *c*, upon the spindle *c'* of which is mounted a toothed wheel *d*, the purpose of which is hereinafter described. The spindle *c'* is rotatably mounted in the upright *e*, which is vertically fixed upon the base-plate *e'*. The cylinder *a* is hollow and serves for the reception of a liquid adapted to act as a solvent upon the substance of which the record-cylinder is formed, said liquid being introduced therein through a valve *f*, which may be pressed back within the cylinder for that purpose, the valve being maintained upon its seat by means of a spring arranged upon its inner side. This valve *f* is furnished with a head or knob *f'*, which projects outside the valve-casing for the purpose of actuating the same. A second upright *e²* is arranged opposite the upright *e*, and in these two uprights spindles *h* and *h'* are mounted in such a manner as to be capable of rotation. These spindles are caused to ro-

tate by means of toothed wheels *g g'*, which are rigidly fixed to the extremity of the spindles *h* and *h'* and gear with the toothed wheel *d*. Pins *i i'*, mounted upon the extremities of a curved or bow-shaped rocking frame *j*, are adapted to be brought into engagement with the spindles *h h'*, this rocking frame *j* being pivoted at *j'* upon the carriage *l*, a spring *k* causing the frame *j* to constantly bear upon one or other of the spindles, one of which latter is provided with a right-hand and the other with a left-hand screw-thread. The carriage *l* embraces the bar or rail *m*, which, together with the bolts *r*, serves to connect the uprights *e* and *e²*. Upon the carriage is mounted a yielding support *n*, carrying a cup *n'*, in which is provided a cushion or pad *o*, of suitable absorbent material.

The operation of my improved device is as follows: When it is desired to render a used phonograph record-cylinder fit for the reception of a fresh record, it is first of all placed upon the conical cylinder *a*. The handle *c* is then rotated, which results in the rotation of the cylinder *a* and the record mounted thereon and at the same time reciprocates the carriage under the cylinder through the medium of the intermeshing gear-wheels, threaded spindles, and rocking frame described. By the rotation of the cylinder *a* and the movement of the carriage the pad *o* is brought under the valve *f* and coming into contact with the head *f'* of the latter thereby lifts the valve, and so permits a small quantity of the solvent liquid contained therein—such as, for example, benzin, turpentine, or the like—to flow into the cup *n'* and upon the pad. During the further progress of the carriage the pad, which has become impregnated in this manner, acts upon the surface of the record-cylinder and dissolves the mass of which it is composed sufficiently to completely efface the slight impressions made upon it by the recording-stylus. Upon the opposite extremity of the spindle *h'* to that upon which the gear-wheel *g'* is mounted is attached an eccentrically-mounted disk *q'*, against which a nose or projection *p* on the rocking frame *j*, pivoted to the carriage *l*, strikes when this latter has reached the extremity of the spindle. By this means the rocking frame *j* is reversed or tilted, so that the pin *i'* is re-

moved from engagement with the spindle *h'* and the pin *i* is caused to engage with the spindle *h*. As the spindles *h* and *h'* are provided with screw-threads of opposite pitch, the carriage will now be caused to travel in the reverse direction, the pad *o* continuing to act upon the record-cylinder. Any variations in the thickness of the cylinder are compensated by the spring *n*², which tends to constantly press the pad *o* against the cylinder.

What I do claim as my invention, and desire to secure by Letters Patent, is—

1. In a device of the character described, a liquid-holding cylinder adapted to receive the record, means for permitting the escape of the liquid from said cylinder in small quantities, means for receiving and applying said liquid to the surface of said record, substantially in the manner and for the purpose set forth.

2. In a device of the character described, a rotatably-mounted liquid-holding cylinder having means for permitting the escape of the liquid therefrom and adapted to receive a phonograph-record, in combination with an absorbent pad or the like, adapted to receive the liquid from said cylinder and to apply same to said record, and means for reciprocating said pad, substantially as described.

3. In a device of the character described, a rotatably-mounted liquid-holding cylinder having a valve therein, and adapted to receive

a phonograph-record, in combination with a reciprocating absorbent pad adapted to receive the liquid from said cylinder and apply same to the said record, and also adapted to automatically open said valve, and common means for rotating said cylinder and reciprocating said pad, substantially in the manner and for the purpose set forth.

4. In a device of the character described, a rotatably-mounted liquid-holding cylinder having a valve therein and adapted to receive a phonograph-record, a resiliently-mounted pad adapted to receive the liquid from said cylinder and to apply it to said record, means for opening said valve, and means for rotating said cylinder, as set forth.

5. In a device of the character described, a rotatably-mounted liquid-holding cylinder having a valve therein, and adapted to receive a phonograph-record, a resiliently-mounted pad adapted to receive the liquid from said cylinder and apply it to said record and also adapted to automatically open said valve, means for reciprocating said pad in contact with said record.

In testimony whereof I affix my signature in presence of two witnesses.

RUDOLF NELLES.

Witnesses:

E. H. L. MUMMENHOFF,
OTTO W. HELLMRICH.



No. 657,280.

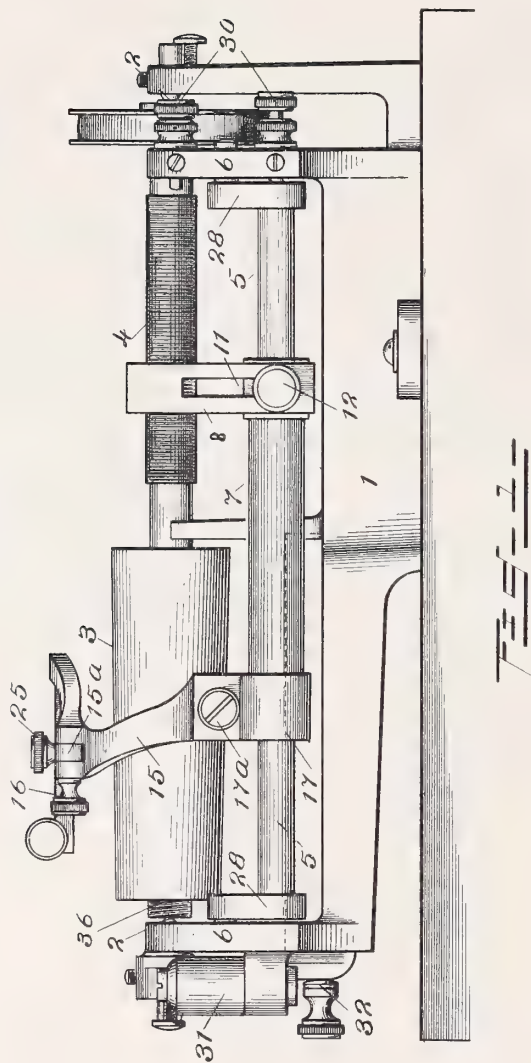
Patented Sept. 4, 1900.

W. BOHNE.
PHONOGRAPH.

(Application filed Mar. 20, 1900.)

(No Model.)

4 Sheets—Sheet 1.



WITNESSES

[Signature]
C. H. Avery

INVENTOR

William Bohn
By *A. Dixon*
Atty.



No. 657,280.

Patented Sept. 4, 1900.

W. BOHNE.
PHONOGRAPH.

(Application filed Mar. 20, 1900.)

(No Model.)

4 Sheets—Sheet 2.

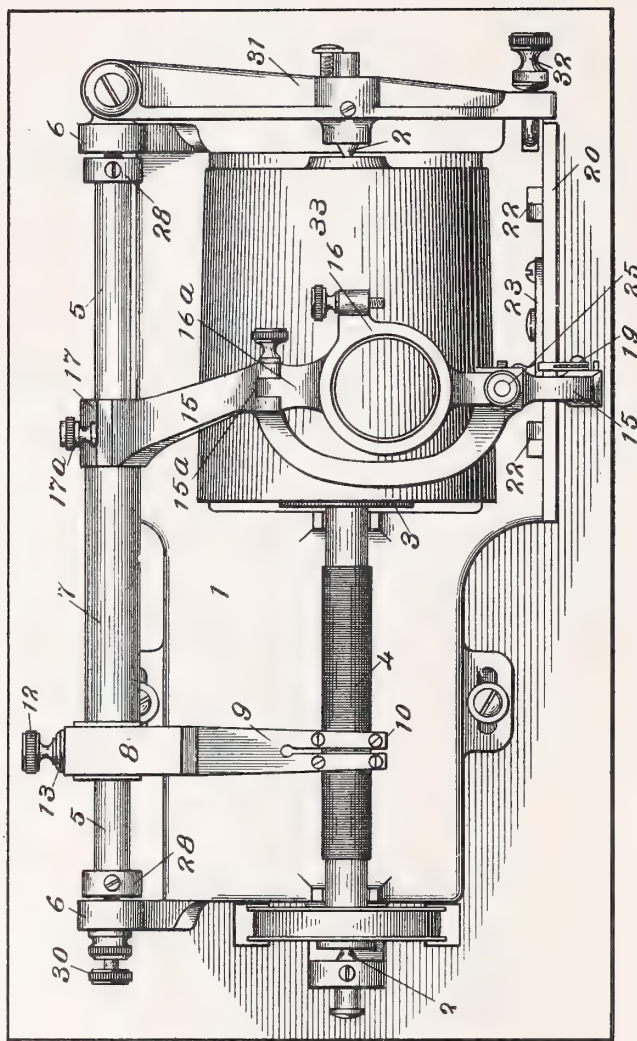


Fig. 2-

WITNESSES

[Signature]
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William Bohn

By A. Dixon

Atty.

No. 657,280.

Patented Sept. 4, 1900.

W. BOHNE.
PHONOGRAPH.

(Application filed Mar. 20, 1900.)

(No Model.)

4 Sheets—Sheet 3.

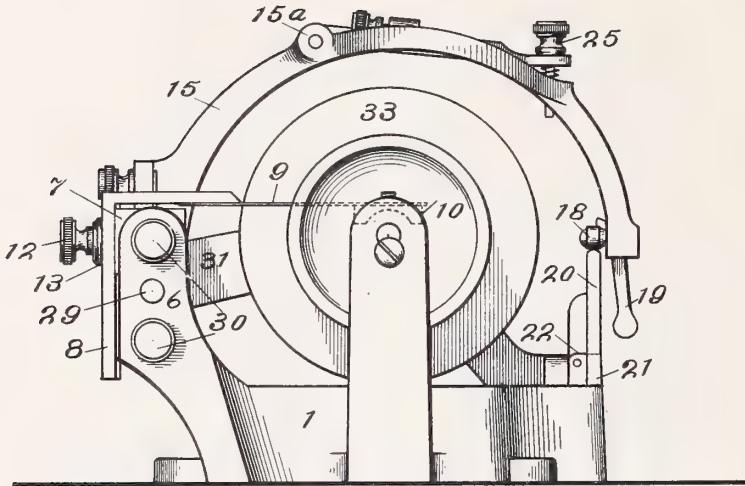


FIG. 3-

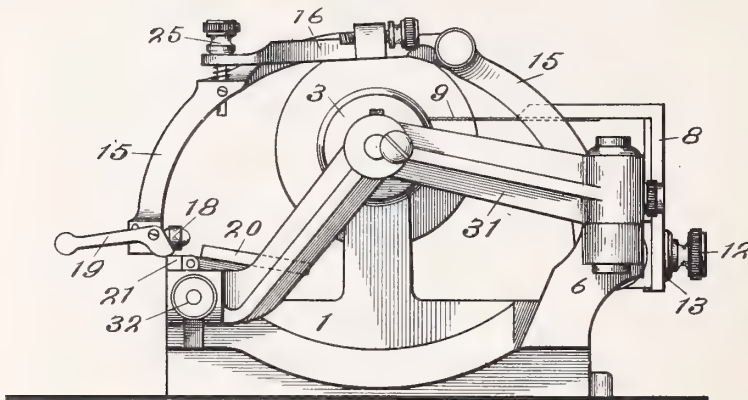


FIG. 4-

WITNESSES

[Signature]
C. H. Avery,

INVENTOR

William Bohn.
By A. Dixon
[Signature]

No. 657,280.

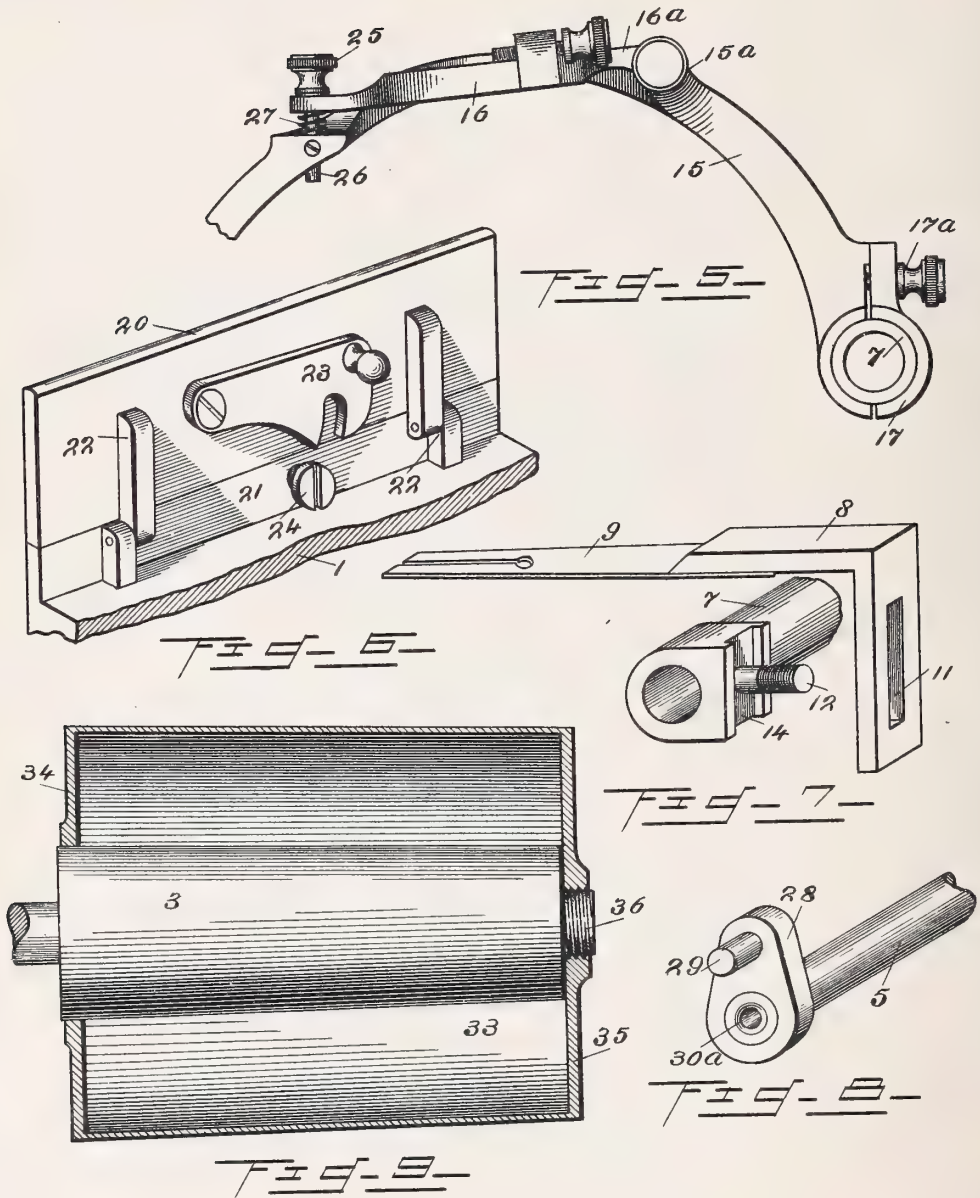
Patented Sept. 4, 1900.

W. BOHNE.
PHONOGRAPH.

(Application filed Mar. 20, 1900.)

4 Sheets—Sheet 4.

(No Model.)



WITNESSES

R. Duff
C. W. Avery

INVENTOR
William Bohn
By A. Dixon
Atty.

UNITED STATES PATENT OFFICE.

WILLIAM BOHNE, OF TORONTO, CANADA.

PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 657,280, dated September 4, 1900.

Application filed March 20, 1900. Serial No. 9,467. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM BOHNE, of the city of Toronto, in the county of York and Province of Ontario, Canada, have invented certain new and useful Improvements in Phonographs; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, which form part of this specification.

My invention relates particularly to that class of phonographs in which cylindrical phonogram-blanks of either small or large diameter can be employed both for recording and reproducing and pertaining not to the manner in which the same may be driven, and is applicable for either electromotive power or spring-motor with the usual controlling devices as employed with such motors and mounted on the case or receptacle in which the above motors may be located. The support for the recorder or reproducer can be adapted for any of the well-known recorders or reproducers and operate with equal efficiency. For convenience I have shown the said support adapted for the Edison recorder or reproducer; and the object of the invention is to simplify the construction and reduce the number of operations when preparing the phonograph to receive the phonogram-blanks on changing from large to small, or vice versa, thereby increasing the utility of the same without sacrificing the efficiency.

The invention consists of an improved mechanism for vertically raising and lowering the recorder or reproducer carrying arm and retaining the same angle of contact with phonogram-blanks of different diameters.

The invention consists also of an improved bushing for supporting the enlarged phonogram-blanks and the manner in which the same is secured to the mandrel or small phonogram-blank holder.

To such ends the invention consists in the construction and combination of parts, hereinafter particularly described and claimed, reference being had to the accompanying drawings, forming part thereof, in which similar figures of reference refer to like parts throughout.

Figure 1 is a side elevation of a phonograph embodying the said improvements. Fig. 2 is

a plan view of the same machine. Fig. 3 is an end elevation of the driving side, showing the same prepared for phonogram-blanks of large diameter. Fig. 4 is an elevation of the opposite end of the machine, showing the same prepared for phonogram-blanks of small diameter. Fig. 5 is a detail view of the recorder or reproducer carrying arm. Fig. 6 is a view in perspective of the carrying-arm track or front rest. Fig. 7 is a detail perspective view of the adjustable angle-bracket and feed-arm with a portion of the sleeve. Fig. 8 is a partial view in perspective of the guide-rod, showing the crank and pivot; and Fig. 9 is a longitudinal sectional view of the large mandrel or cylindrical bushing, showing the manner in which the same is secured to the small mandrel.

Upon and supported above the body 1 and on the usual point-bearings 2 are the phonogram-blank mandrel 3 and feed-screw 4 and eccentrically-pivoted guide-rod 5, supported on standards 6 and carrying the sleeve 7. At one end of sleeve 7 is a vertically-adjustable angle-bracket 8, with flexible extension 9, carrying the feed-nut 10, which has a bearing on the feed-screw 4.

In the upright portion of the angle-bracket 8 is an elongated slot 11, operating in which and for the purpose of securing the bracket to the sleeve is a knurled-headed screw 12 or nut and stud with washer 13. To retain the angle-bracket 8 in a vertical position and to permit the same to be raised or lowered when the screw 12 is slackened a portion of the said bracket enters an elongated groove of guide 14, formed in the flattened portion of the sleeve 7. On the upper portion of the said bracket 8 and secured to the same is the flexible extension 9, having secured thereto the feed-nuts 10. At the opposite end of the sleeve 7 and extending over the mandrel 3 in the form of a semicircle is the recorder or reproducer carrying arm 15, supporting at its center the recorder or reproducer adjustable holder 16. This arm at its base is secured to the sleeve 7 by a split collar or clamp 17 with knurled-headed screw 17^a, the only object of which is to permit of regulating the pressure of the feed-nut 10 when in contact with the feed-screw 4 and is accomplished by a slight canting of the angle-bracket 8. On the op-

posite end of the arm 15 and supporting the same is, preferably, a roller 18 and key-lever 19, operating on the elevated track 20 or lower track 21. When it is desired to raise the recorder or reproducer carrying arm 15 and disengage the recorder or reproducer point from contact with the phonogram-blank and also raise and disengage the feed-nut 10 from the feed-screw, the key-lever 19 is raised, as shown in Fig. 4, and vice versa, as shown in Fig. 3.

The track 21 is an integral part of the body 1 and of a lower elevation and directly below the track 20. To allow the track 20 to be displaced and removed from over the track 21, the same is hinged to the body 1 with hinges 22, as shown. To retain the track 20 in a vertical position and hold the same secure a latch 23, fulcrumed on the track 20, and catch 24 on the body 1 are employed, as shown.

To compensate for the difference in thickness of phonogram-blanks and maintain the recorder or reproducer point when in contact with the blank at the proper angle, the holder 16 is vertically adjustable and raised or lowered by the knurled nut 25, traveling on the threaded pin 26. Encircling the pin 26 and below the projecting lug of the holder 16 and resting on the arm 15 is a spiral spring 27 for the purpose of maintaining the holder in contact with the adjusting-nut 25. The opposite end 16^a of the said holder is hinged to the said arm 15 by the hinge 15^a. This portion of the said arm 15—namely, the holder 16—can be readily removed and replaced by a holder suitable for any of the well-known recorders or reproducers and use the said adjustment.

When it is desired to change the machine and operate with large phonogram-blanks in place of small ones, the following changes are made. The sleeve 7, supporting the recorder or reproducer carrying arm 15 is raised by the rotating of the eccentrically-pivoted guide-rod 5 and elevated track 20. The difference in elevation of the said track 20 above the track 21 is equal to half the difference of the diameters of the different-sized phonogram-blanks. At the extremities of the guide-rod 5 are secured cranks 28, with wrist-pins 29, fulcrumed in the standards 6 and having a radius equal to one-quarter of the aforesaid difference in diameter of the blanks. To retain the said guide-rod when elevated or lowered and hold the same secure, a spring-actuated plunger 30 is forced by a spiral spring into the hole or recess 30^a within the center of the guide-rod 5. The plungers 30 are two in number and preferably at one end of the guide-rod and supported by the said standard 6. To facilitate the withdrawing of the plungers, an enlarged knurled head is formed on one end. To compensate for the elevating of the sleeve 7 and maintain the feed-nut in operative contact with the feed-screw, the bracket 8 is lowered and in the position shown in Fig. 3. To increase the size of the mandrel

3 and prepare the same to receive the large phonogram-blanks, the gate 31, carrying the point-bearing 2, is released by the lock 32 and swings back, allowing free access to the mandrel 3.

The large mandrel 33 consists of a large cylinder with internal annular flanges secured to its ends. The opening in the end 34 coincides with the large diameter of the mandrel 3, while the opening in the end 35 is considerably smaller in diameter and threaded to correspond with the thread 36, projecting from the small end of the mandrel 3. To place the large mandrel 33 on the machine, it is passed over the small mandrel 3, enveloping the same, and wound on in the reverse direction to that in which the machine operates, and thereby preventing the same from becoming loose.

Should it be found desirable to dispense with the end 34, the mandrel may be supported by the end 35 and thread 36 solely.

Having described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a phonograph, the combination of a rotating support adapted to receive phonogram-cylinders of different diameter, a recorder or reproducer carrying arm, a vertically-adjustable guide-rod, a sleeve traveling longitudinally on said guide-rod and supporting said arm, a vertically-adjusted feed-arm supported on said sleeve, and means for supporting the free end of said arm and at different elevation to correspond with the vertical adjustment of said guide-rod, substantially as set forth.

2. In a phonograph, the combination of a rotating support adapted to receive phonogram-cylinders of different diameter, a recorder or reproducer carrying arm, an eccentrically-pivoted guide-rod carrying a longitudinally-traveling sleeve, means for maintaining said guide-rod at its different elevations, said sleeve supporting said arm and a vertically-adjustable feed-arm, means for maintaining said feed-arm vertical when adjusting and at different elevations when adjusted, and a plurality of supports for the free end of said arm and of different elevations to correspond with the vertical adjustment of said sleeve, substantially as set forth.

3. In a phonograph, the combination of a recorder or reproducer carrying arm adapted to travel longitudinally over the phonogram-cylinders, tracks of different elevations for supporting the free end of said arm, the upper track hinged and swinging into a vertical position over the lower track, means for retaining the said upper track in a vertical position over the lower track, whereby the arm is adjusted for cylinders of different diameters, substantially as set forth.

4. In a phonograph, the combination of a movable arm traveling longitudinally over the phonogram-cylinders, an independent recorder or reproducer holder supported by said

arm, said holder fulcrumed on said arm, a pin screw-threaded at its upper end and passing freely through the said holder, but fastened to the said arm, a nut screwing on the threads
 5 of the said rod and bearing on the top of the said holder to adjust the vertical, pivotal position of the latter, and a spring interposed between the said arm and holder, whereby any difference in the thickness of phonogram-
 10 blanks is compensated for, and whereby the point of the recorder or reproducer is maintained at the proper angle of contact, substantially as set forth.

5. In a phonograph, the combination of a
 15 rotating mandrel for phonogram-cylinders of small diameter, a cylindrical bushing envelop-

ing the said mandrel for phonogram-cylinders of large diameter; an internal annular flange adapted to support the cylindrical bushing upon said mandrel, a threaded projection extending from the small end of said mandrel,
 20 a threaded opening in said annular flange corresponding with the threaded projection on said mandrel, substantially as shown and described.

In witness whereof I have hereunto set my hand in presence of two witnesses.

WILLIAM BOHNE.

Witnesses:

C. W. AVERY,
 H. DIXON.

1880-1881
M. M.
M.

68/57

No. 657,527.

Patented Sept. 11, 1900.

T. A. EDISON.

PROCESS OF MAKING METALLIC DUPLICATE PHONOGRAPH RECORDS.

(Application filed May 4, 1900.)

(No Model.)

Fig. 3

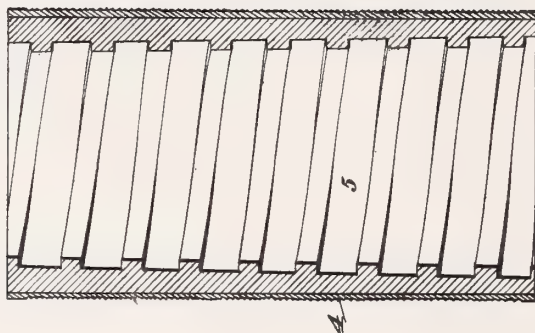


Fig. 2

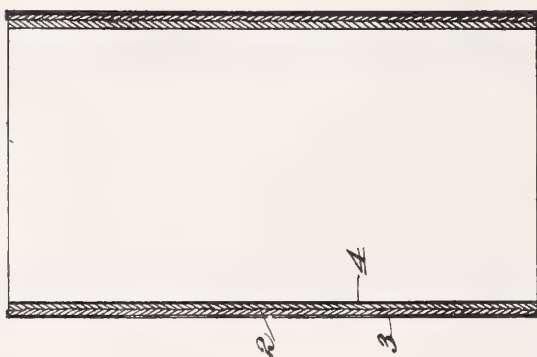
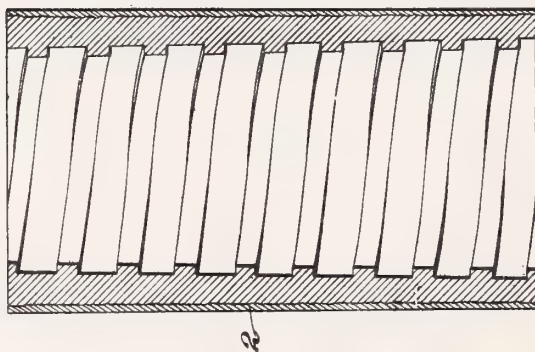


Fig. 1



Witnesses:

James F. Coleman
Archibald T. Rice

Inventor

Thomas A. Edison

by *Edmund S. Allen*
Att'ys.

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

PROCESS OF MAKING METALLIC DUPLICATE PHONOGRAPH-RECORDS.

SPECIFICATION forming part of Letters Patent No. 657,527, dated September 11, 1900.

Application filed May 4, 1900. Serial No. 15,453. (No specimens.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, a citizen of the United States, residing at Llewellyn Park, in the county of Essex and State of New Jersey, have invented a certain new and useful Process of Making Metallic Duplicate Phonograph-Records, (Case No. 1,035,) of which the following is a description.

My present invention relates to an improved process for securing from an original phonographic record an absolutely-accurate metallic copy thereof. By means of my improved process records possessing a high intrinsic value may be copied with absolute accuracy, so as to be preserved indefinitely. The process also provides for the making from original records of accurate metallic masters suitable for use in the making of subsequent duplicates by a mechanical process, as is now practised, and which masters by reason of their metallic character will permit the making of a very much larger number of duplicates by a mechanical process than is now possible.

In carrying my invention into effect I first obtain a suitable metallic matrix, bas-relief, or negative copy of an original record. Assuming the original record to have been formed on a cylindrical blank, this matrix will be in the form of a cylindrical shell with the record in negative or relief within its bore. I then deposit a different metal upon the surface of the matrix carrying the record in negative or bas-relief until the desired thickness of deposit is secured, after which I subject the matrix carrying the metal deposited thereon or therein to a treatment by which the deposited metal will be freed from the matrix, so as to therefore carry upon its surface an absolutely-accurate copy of the original record. I prefer to make the matrix of copper and to deposit silver upon the surface of the matrix carrying the record, whereby a silver copy will be secured, and to dissolve the copper matrix from the silver deposit by treatment with hydrochloric acid or other solvent of copper which does not affect silver; but it will be understood that other metals may be used which may be subjected to other treatments for the separation of the matrix from the metallic deposited copy.

In carrying my invention specifically into

effect I may conveniently adopt the following procedure, from which the scope and modifications of which my invention is susceptible will be apparent, reference being had to the accompanying drawings, which are illustrative of the process, and wherein—

Figure 1 represents a longitudinal sectional view through an ordinary cylindrical phonograph-record, illustrating the deposition of a matrix thereon; Fig. 2, a corresponding view showing the matrix separated from the record, coated on its exterior with a waterproof material and with a metallic deposit on its bore; and Fig. 3, a corresponding view showing the finished copy or duplicate.

In all of the above views corresponding parts are represented by the same numerals of reference.

1 represents an ordinary cylindrical phonograph-record made of a soap or soap-like composition, as is common, having a tapered bore, the record being formed on its exterior face in a spiral groove. Assuming that a record of this character is to be copied in metal, I first secure a matrix 2 of the record. Preferably this matrix is formed by first coating the original record with a minutely-thin film of metal by a process of vacuous deposit, as I describe in my Patent No. 526,147, dated September 18, 1894, after which the film so secured is plated, preferably with copper, by an electrodeposition process until a matrix having a thickness of about one thirty-second of an inch is secured. The matrix obviously may be made by other processes; but that indicated is advantageous, because of its great accuracy. The record 1 is now removed from the matrix 2 either by melting out the cylinder or by subjecting it to cold, so as to shrink it from the matrix, or in any other way. Obviously I will now have secured a thin cylindrical matrix carrying on its bore a copy in negative or relief of the record originally formed in intaglio on the cylinder 1. This matrix is coated on its exterior and upper and bottom faces with a suitable waterproof composition—such as stearin, paraffin, or other water-repellent substance—said coating being indicated in Fig. 2 by the numeral 3, and after being so prepared the waterproofed matrix is suspended in a plating-bath and a coating 4 of a different metal from the matrix is de-

posited on the bore thereof and directly upon the record in negative or bas-relief. The metal which is thus deposited on the bore of the matrix is preferably silver when the matrix is formed of copper. The deposit of the layer 4 of different metal is continued until a coating of sufficient thickness is secured, one of a thirty-second of an inch being ordinarily sufficient. The matrix 2 is now removed from the deposited metal 4 in any suitable way, but preferably by an acid treatment, which dissolves the metal of the matrix 2 without affecting the metal of the deposit 4. When the matrix is formed of copper and the deposited metal 4 is silver, the matrix carrying the deposit may be immersed in a hydrochloric-acid solution, which will dissolve the copper matrix without affecting the silver deposit. Having thus dissolved or otherwise removed the matrix from the deposited metal, it will be obvious that I am enabled to secure a metallic shell of the desired thickness, carrying on its surface an absolutely-faithful copy of the original record. The shell thus secured can be used without further treatment in a reproducing or duplicating apparatus; but it preferably is provided with a backing 5, of plaster-of-paris, cement, or any other suitable material, which may be conveniently formed with a tapered bore for use on an ordinary phonograph or mechanical duplicating machine.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is as follows:

1. The process of making a metallic duplicate from an original phonograph-record, which consists in first forming a matrix in relief of the original record, in then depositing a metal upon the matrix, and in finally removing the matrix from the metal deposited thereon, substantially as set forth.

2. The process of making a metallic duplicate from an original phonograph-record, which consists in depositing a metal upon an original record so as to form a matrix with the record in relief or negative thereon, in depositing a metal upon the matrix whereby the record will be formed in positive upon the deposited metal, and in separating the matrix from the deposited metal, substantially as set forth.

3. The process of making a metallic duplicate from an original phonograph-record, which consists in forming a metallic matrix of the original record, in depositing a different metal upon the metallic matrix, and in dissolving the metallic matrix from the metal deposited thereon, substantially as set forth.

4. The process of making a metallic duplicate from an original phonograph-record, which consists in depositing a metal upon the original record to form a matrix with the record in relief, in depositing a different metal upon the matrix, and in dissolving the metallic matrix from the deposited metal, substantially as set forth.

5. The process of making a metallic duplicate from an original phonograph-record, which consists in forming a metallic matrix of the original record, in waterproofing the matrix except on such portions carrying the record in negative, in depositing a different metal upon the uncoated portion of the matrix, and in removing the matrix from the deposited metal, substantially as set forth.

6. The process of making a metallic duplicate from an original phonograph-record, which consists in forming a metallic matrix of the original record, in waterproofing the matrix except on such portions carrying the record in negative, in depositing a different metal upon the uncoated portion of the matrix, and in dissolving the matrix from the deposited metal, substantially as set forth.

7. The improved process of making a metallic copy of a cylindrical phonographic record, which consists in depositing a metal upon the cylindrical record to form a matrix, in separating the original record from the matrix, in depositing a different metal upon the bore of the matrix, and in separating the matrix from the deposited metal, substantially as set forth.

8. The improved process of making a metallic copy of a cylindrical phonographic record, which consists in depositing a metal upon the cylindrical record to form a matrix, in separating the original record from the matrix, in depositing a different metal upon the bore of the matrix, and in dissolving the matrix from the deposited metal, substantially as set forth.

9. The improved process of making a metallic copy of a cylindrical phonographic record, which consists in depositing a metal on the original record to form a cylindrical matrix, in waterproofing the exterior of the matrix, in immersing the matrix in a plating-bath and depositing a different metal on its bore, and in removing the matrix from the deposited metal, substantially as set forth.

10. The improved process of making a metallic copy of a cylindrical phonographic record, which consists in depositing a metal on the original record to form a cylindrical matrix, in waterproofing the exterior of the matrix, in immersing the matrix in a plating-bath and depositing a different metal on its bore, and in dissolving the matrix from the deposited metal, substantially as set forth.

11. The process of making a metallic duplicate from an original phonograph-record, which consists in securing a copper matrix of the original record, in depositing silver on the matrix, and in subjecting the combined matrix and silver deposit to the action of hydrochloric acid to dissolve the copper, substantially as set forth.

12. The process of making a metallic duplicate from an original phonograph-record, which consists in depositing copper on the original record to form a matrix, in depositing silver upon the copper matrix, and in

subjecting the matrix and its silver deposit to the action of hydrochloric acid to dissolve the copper, substantially as set forth.

13. The improved process of making a metallic copy of a cylindrical phonographic record, which consists in depositing copper upon the original record to form a cylindrical matrix, in depositing silver upon the bore of the cylindrical matrix, and in subjecting the matrix and silver deposit to hydrochloric acid to dissolve the copper from the silver, substantially as set forth.

14. The improved process of making a metallic copy of a cylindrical phonographic rec-

ord, which consists in depositing copper upon the original record to form a cylindrical matrix, in waterproofing the exterior of the copper matrix, in depositing silver upon the interior of the matrix, and in subjecting the matrix and silver deposit to hydrochloric acid to dissolve the copper from the silver, substantially as set forth.

This specification signed and witnessed this 30th day of April, 1900.

THOMAS A. EDISON.

Witnesses:

J. F. RANDOLPH,
FRANK L. DYER.

65 / 32 /



No. 657,731.

Patented Sept. 11, 1900.

J. F. ELDRED.

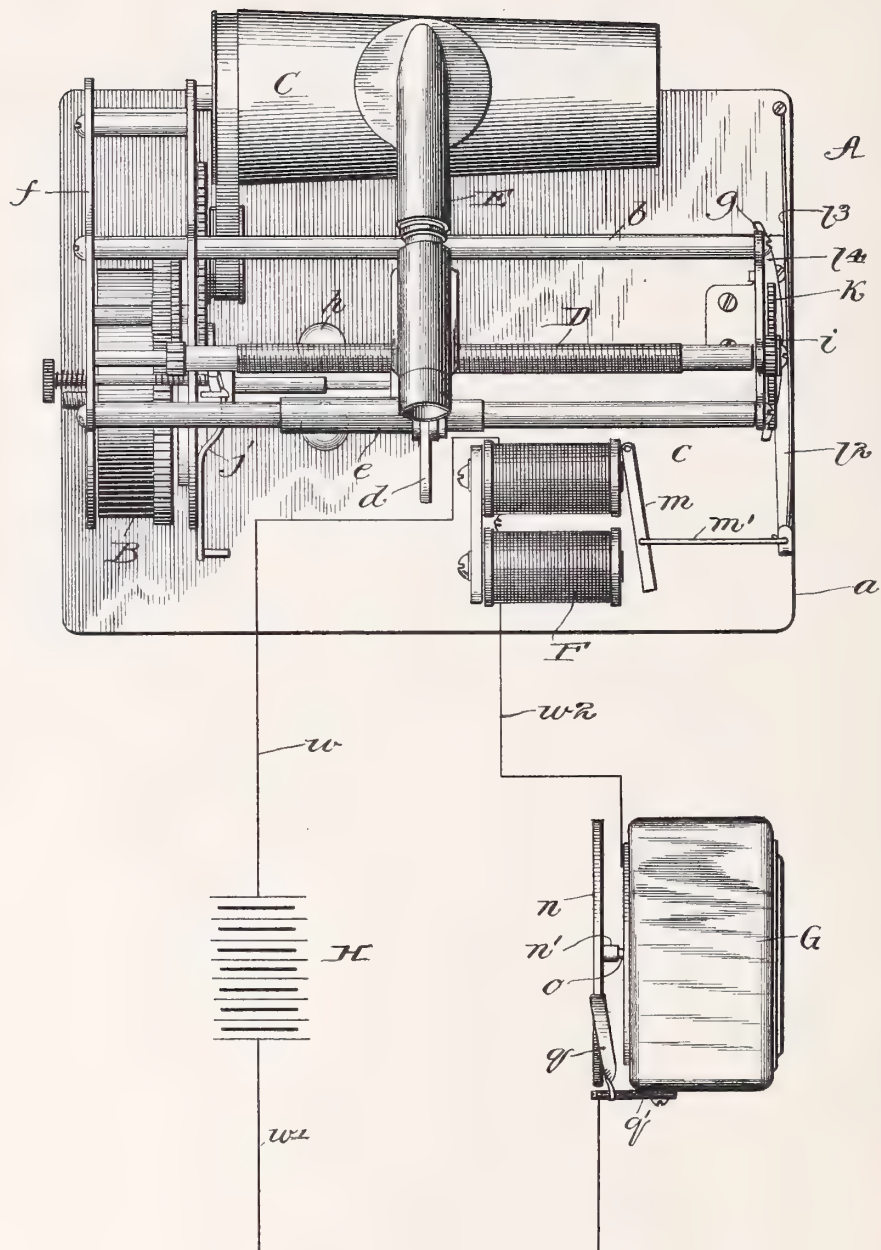
GRAPHOPHONE CLOCK.

(Application filed Oct. 28, 1899.)

(No Model.)

2 Sheets—Sheet 1.

Fig. 1.



Witnesses,
D. H. Lee
H. G. Barrett

D. M. Lee
H. G. Barrett

H. G. Barrett

Inventor:

John E. Eldred,

By *Dunfrevh* ^{*Ans*} *Dunfrevh*,
Attys.

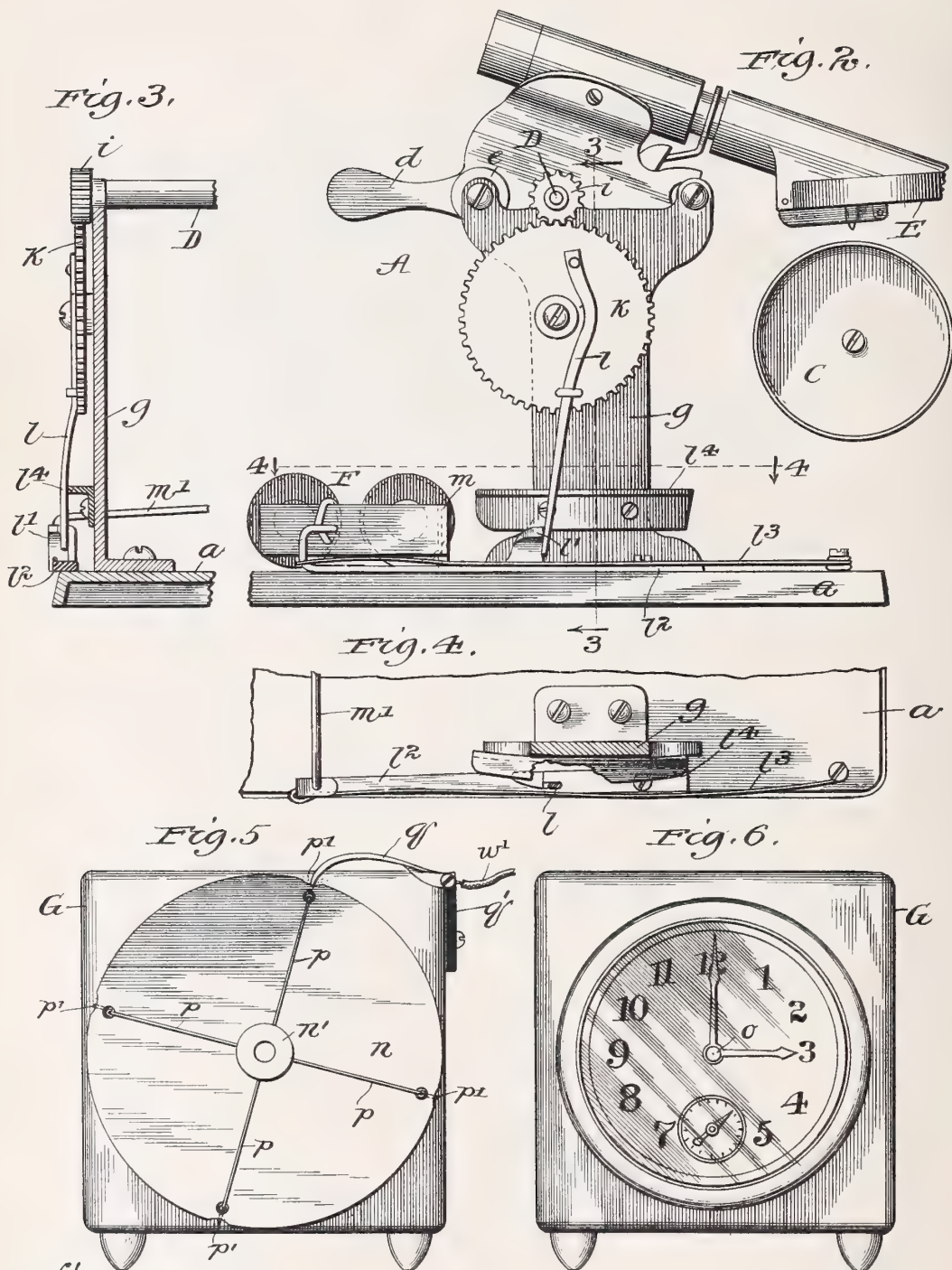


J. F. ELDRED.
GRAPHOPHONE CLOCK.

(Application filed Oct. 28, 1899.)

(No Model.)

2 Sheets—Sheet 2.



Witnesses:
G. H. Lee
H. B. Barrett.

Inventor:
John F. Eldred.
By Dyrenfurth & Dyrenfurth, Attys.

UNITED STATES PATENT OFFICE.

JOHN F. ELDRED, OF CHICAGO, ILLINOIS.

GRAPHOPHONE-CLOCK.

SPECIFICATION forming part of Letters Patent No. 657,731, dated September 11, 1900.

Application filed October 28, 1899. Serial No. 735,056. (No model.)

To all whom it may concern:

Be it known that I, JOHN F. ELDRED, a citizen of the United States, residing at No. 1644 Melrose street, Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in a Combined Clock and Graphophone, of which the following is a specification.

My invention relates to an improved combination with a clock of a speech-reproducing instrument (gramophone, graphophone, or phonograph) for causing the latter to call out the hour or fraction thereof as the same is registered upon the clock-dial.

Generally stated, my improvement involves an electric brake on the reproducing instrument normally checking the motor of the latter and released at predetermined periods by the action of the clock in temporarily closing the circuit to actuate the instrument to announce the time suitably recorded upon its disk or cylinder.

Referring to the accompanying drawings, Figure 1 is a plan view showing a graphophone combined with a clock through the medium of my improvement; Fig. 2, a view of the same in end elevation, showing the brake mechanism; Fig. 3, a section taken at the line 3 3 on Fig. 2 and viewed in the direction of the arrows; Fig. 4, a broken section taken at the line 4 4 on Fig. 3 and viewed in the direction of the arrows; Fig. 5, a view in rear elevation of the clock provided with a circuit-closing disk on its minute-hand shaft, and Fig. 6 a view of the clock in front elevation.

For illustrating my improvement I have selected a graphophone A, which may involve any suitable or well-known construction and need not, therefore, be described herein in detail. That shown is of the variety employing a spring-motor B on the base *a*, geared with a record-cylinder C to rotate it and with the threaded shaft D to rotate it for producing the travel of the stylus device E, which crosses it and is supported at its forward end on a rod *b* and at its rear end on a rod *c* through the medium of a sleeve *e*, carrying a clutch-lever device *d* for engagement with the thread of the shaft D to connect therewith the stylus device, the rods and threaded shaft being supported at their opposite ends in

bearing-plates *f* and *g*, rising from the base. At *h* is shown a governor for the spring-motor, and at *j* is shown the brake device for locking the motor, as while its spring is being wound.

On one end of the shaft D is a pinion *i*, meshing with a toothed wheel *k*, journaled on the outer side of the plate *g* and carrying a stop-finger *l*, into the path of the free end of which there normally projects a stop-lug *l'*, extending upward from a lever *l''*, fulcrumed at one end on the base to turn horizontally thereon and controlled by a spring *l'''*, tending to hold it yieldingly in position to present the lug *l'* in the path of the stop-finger. Near the base of the plate *g* is shown a curved guide-ledge *l''''* for the stop-finger.

F is an electromagnet having its pivotal armature *m* connected by a link *m'* with the free end of the lever *l''*, and G is a clock of any suitable variety equipped with electrical circuit-closing mechanism. This mechanism may be, as shown, a disk *n*, of insulating material, centrally secured at its tubular metal socket *n'* to the rearwardly-projecting end of the minute-shaft *o* of the clock and having at equal intervals metal strips or wires *p*, extending radially from its metallic center and terminating at shallow notches *p'* in the periphery of the disk, bearing against which is the free end of a metal contact-finger *q*, pivoted at its opposite end to an insulated support *q'* on the clock-casing.

The magnet F is included in the circuit of a battery (indicated at H, Fig. 1) by a wire *w*, leading from one pole thereof to one side of the magnet, a wire *w'* leading from the other pole of the battery to the contact-finger *q*, from which the circuit is continued over one or the other of the strips *p* and socket *n'* through the clock (or clock-frame if it be of metal) to the opposite side of the magnet over a wire *w''*, connecting it with the clock. As arranged the strips *p* provide the disk *n* with four circuit-closing points, whereby the circuit closure occurs at intervals one-quarter of an hour apart. With the record-surface of the cylinder C provided at proper intervals with announcements of the quarter-hours of time, (as 12.15, 12.30, 12.45, 1 o'clock,) requiring that there shall be forty-eight announcements upon it for each twelve hours, after which

the stylus device E should be returned to its initial position either by hand or automatically, (for which latter purpose provision is made on some varieties of graphophones,) the operation is as follows:

In the rotation of the disk *n* with that of the minute-hand of the clock, each time a notch *p'* is brought coincident with the finger *q* it drops into the respective notch and contacts with the extremity of the wire *p* therein exposed, with the effect of closing the circuit to energize the magnet, which thereupon attracts the armature. The movement of the armature pulls the lever *l*² with it, thereby withdrawing the lug *l'* out of the path of the stop-finger *l*, the normal engagement of which with the lug affords a brake against action of the spring of the motor B, so that when the stop-finger is thus freed the motor-spring drives the screw-shaft D to cause the stylus device to travel upon it and reproduce the time announcement it encounters on the cylinder C. The extent of contact-surface presented at the extremity of a wire *p* is so small that owing to the continuous rotation of the disk *n* the circuit closure is only momentary, so that immediately after the magnet is energized it is deenergized by opening of the circuit, thereby permitting the recoil force of the spring *l*³ to retract the armature and also the lever *l*² again to present the stop-lug *l'* in the path of the finger *l*. Rotation of the shaft D by rotating the pinion *i* turns the wheel *k* through a complete revolution, when it is arrested by the finger *l* encountering the lug *l'* in its path, thereby braking the motor B and maintaining it inactive until the circuit is again closed by the continued movement of the disk *n* to repeat the described operation.

As will be understood, the extent of record-surface on the cylinder C is so divided up by the time announcements thereon that in each operation of the apparatus the stylus device and cylinder shall coöperate to complete an announcement.

Suitable contact mechanism for my purpose may be provided in various forms differing from the form thereof shown and described. Hence I do not limit my invention in that particular. Moreover, the brake mechanism formed by the finger *l* and lug-carrying lever *l*², connected with the magnet-armature, may be arranged differently from the arrangement thereof herein set forth or constructed otherwise than shown and described without departure from my invention, the essential features of which are suitable brake mechanism for the motor of a graphophone or analogous instrument combined with a clock and an electromagnet with which

the brake mechanism is releasably connected in normally-open electric circuit closed by the clock at predetermined intervals of time to energize the magnet to release the brake mechanism, and thereby permit the motor to actuate the said instrument to announce the time recorded upon it and shown by the clock. Obviously it is also within my invention to provide matter other than time announcements, such as advertising matter on the record-surface of the cylinder.

What I claim as new, and desire to secure by Letters Patent, is—

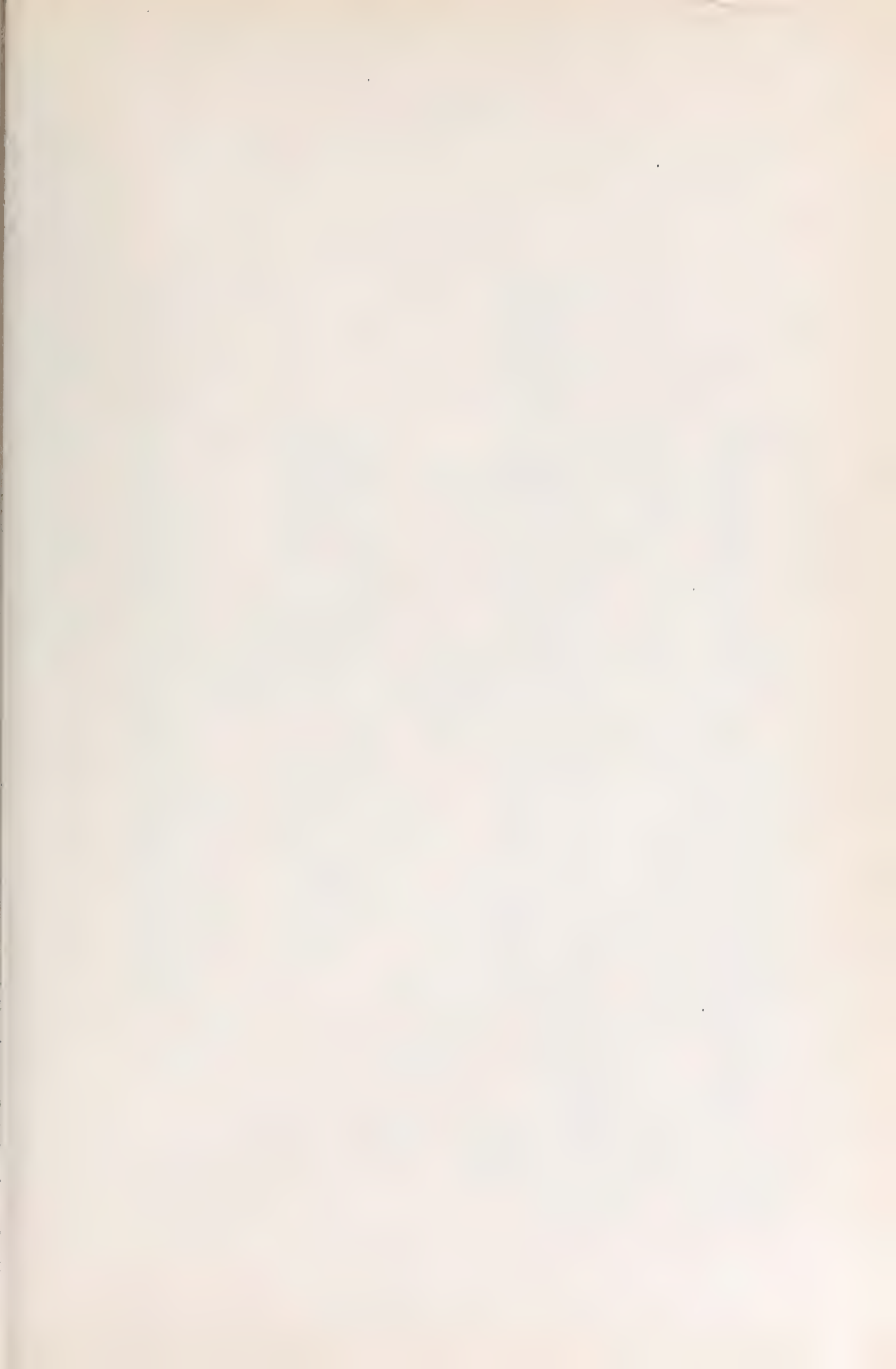
1. In combination, a clock provided with electric-circuit-closing mechanism operated at predetermined intervals by the clock-movement, a speech-reproducing instrument having its record-surface provided with announcements according to the intervals at which said clock-movement is operated, having its threaded shaft provided on its outer end with a pinion, a toothed wheel journaled on the instrument to mesh with said pinion and carrying a stop-finger, a guide for said finger, a spring-controlled lever carrying a stop-lug normally projecting into the path of said finger to check the motor of said instrument, an electromagnet having its pivotal armature linked to the free end of said lever to move the stop out of the path of said finger by movement of the armature and thereby release said motor, and an electric generator-circuit containing said magnet and circuit-closing mechanism, substantially as and for the purpose set forth.

2. In combination, a clock carrying on the shaft of its minute-hand a disk of insulated material having a metallic center electrically connected with the clock and from which radiate at intervals metallic strips terminating at notches equidistant apart in the periphery of the disk, a contact-finger supported on the clock to engage with said periphery, a speech-reproducing instrument having its record-surface provided with announcements according to the intervals at which said clock-movement is operated, brake mechanism normally checking the motor of said instrument, an electromagnet having its armature connected with said brake mechanism to release it by movement of the armature, and an electric generator-circuit containing said magnet and contact-finger to be closed by contact of said finger with a strip on said disk in its rotation, substantially as and for the purpose set forth.

JOHN F. ELDRED.

In presence of—

D. W. LEE,
F. J. MARTIN.

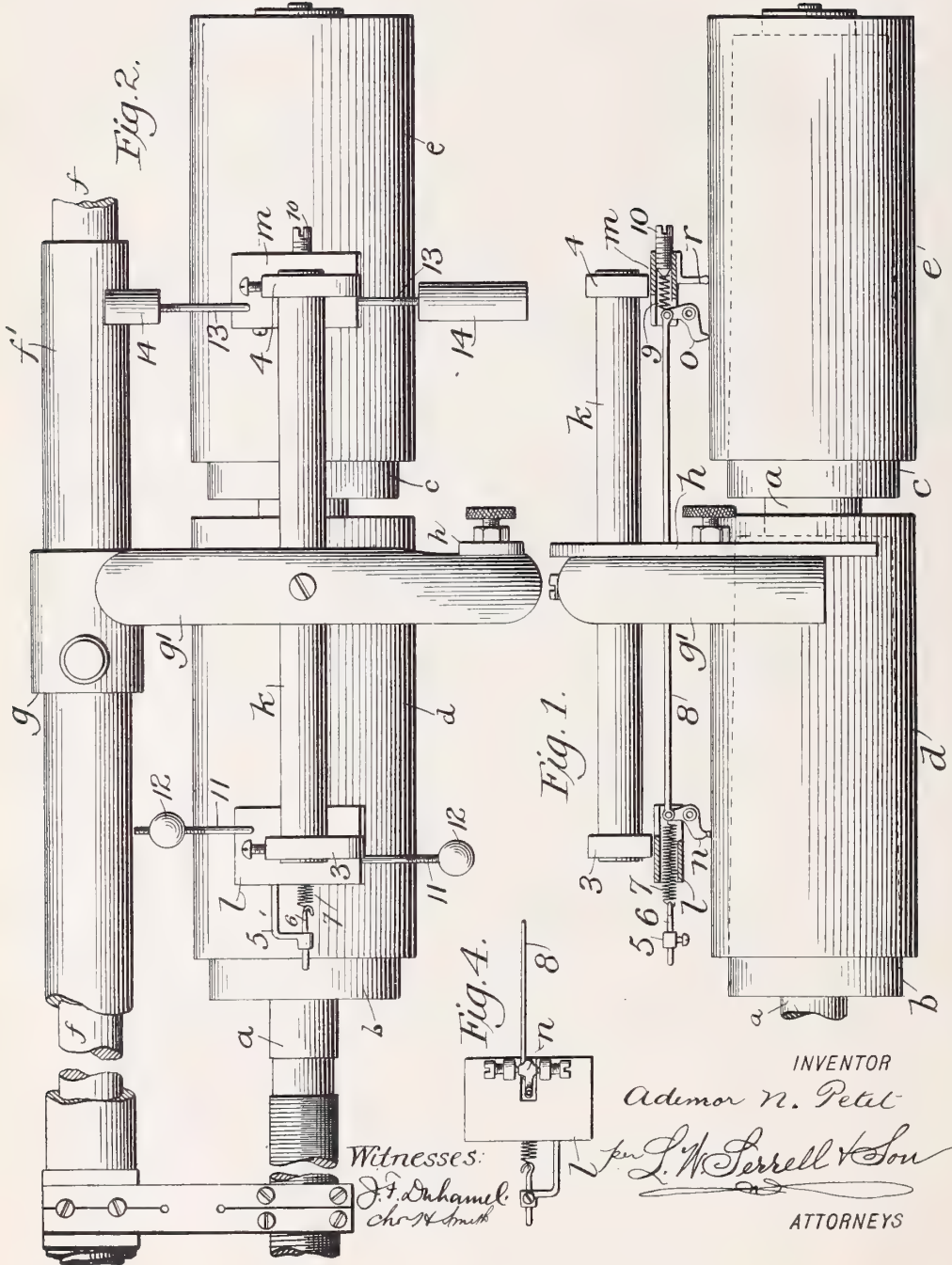


A. N. PETIT.
PHONOGRAPH.

(Application filed Oct. 27, 1899.)

(No Model.)

2 Sheets—Sheet 1.



No. 657,785.

Patented Sept. 11, 1900.

A. N. PETIT.
PHONOGRAPH.

(Application filed Oct. 27, 1899.)

(No Model.)

2 Sheets—Sheet 2.

Fig. 3.

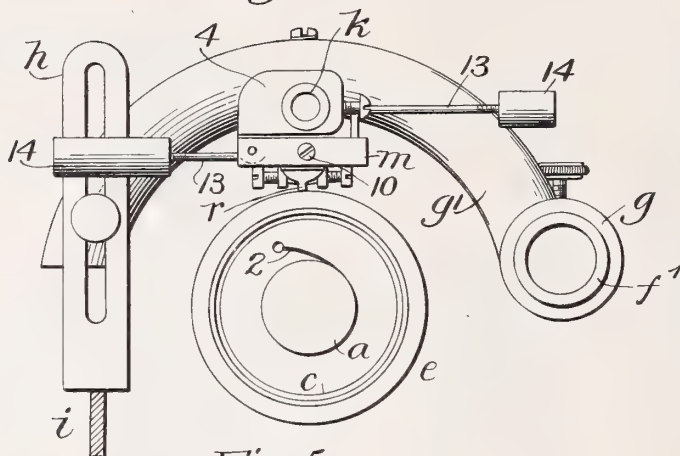
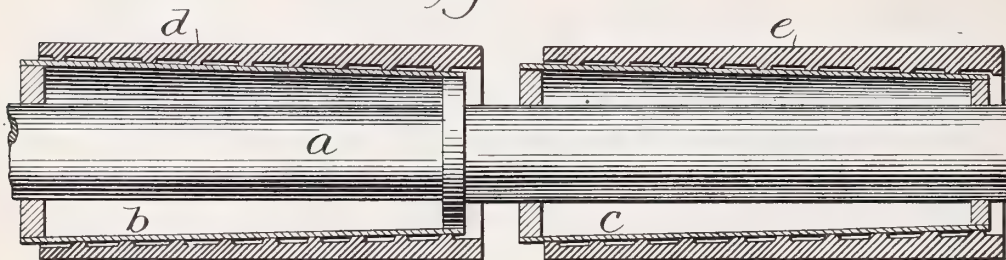


Fig. 5.



WITNESSES

James F. Duhamel
Chas. H. Smith

INVENTOR

Ademor N. Petit
per L. H. Lillard & Son

ATTORNEYS

UNITED STATES PATENT OFFICE.

ADEMOR N. PETIT, OF NEWARK, NEW JERSEY.

PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 657,785, dated September 11, 1900.

Application filed October 27, 1899. Serial No. 734,934. (No model.)

To all whom it may concern:

Be it known that I, ADEMOR N. PETIT, a citizen of the United States, residing at Newark, in the county of Essex and State of New Jersey, have invented an Improvement in Machines for Reproducing Phonograph and Similar Records, of which the following is a specification.

This invention relates to mechanical devices for reproducing phonograph or similar records.

Heretofore two records have been simultaneously made by two recording-styles on blanks upon a single shaft with the blanks in line, and records have also been reproduced where the record and the blank were on parallel shafts with the following and reproducing styles between and in the same axial plane of the shafts; but in this device there was liability of either cutting too deep or not deep enough, and thus preventing the perfection of the reproduction. In carrying out my invention I employ a shaft for a phonograph record-cylinder and a blank cylinder, the said parts being in line on the said shaft, and a following-style is in engagement with the record-cylinder and the reproducing-style in engagement with the blank cylinder, and I employ supports for the said parts and means for connecting the following and reproducing styles, so as to cause them to move in unison, and I further employ adjustable devices for regulating the weight or pressure upon the said styles and also for controlling the position of the reproducing-style. The connection between the following and the reproducing styles maintains the said parts in a constant relation to one another and also causes the movement of the one from the other to regulate the extent and depth of the cut. The adjustable pressure upon the following-style is for keeping the same in the minute grooves of the record and to cause the point to follow the undulations of the same, and the adjustable weights acting upon the reproducing-style are for insuring the proper depth of cut, so that the same may be caused to agree with that of the following-cylinder.

In the drawings, Figure 1 is an elevation and partial section, and Fig. 2 a plan and Fig. 3 an end view representing the devices of my improvement. Fig. 4 is an inverted plan of

the following-style and adjacent parts, and Fig. 5 is a longitudinal section through the record-cylinder and the blank cylinder and the supports therefor on the same shaft.

The shaft *a* is mounted in and supported by suitable bearings, and upon said shaft *b* represents a fixed record-cylinder sleeve or carrier, and *c* represents a removable sleeve or carrier for the blank cylinder.

d represents the record-cylinder, and *e* the blank cylinder. The cylinders are presumed to be of the same diameter and to have parallel surfaces, but tapering inner surfaces to fit upon the tapering sleeves *b c*. The removable sleeve *c* is frictionally held to the shaft *a*. Any suitable device may be employed for this purpose. I have, however, shown a friction-spring 2 formed of the metal of the cylinder-head at the outer end. This is in the nature of a spring-tongue the point of which bears upon the shaft, and as the sleeve *c* is removable from the shaft it may also be placed nearer to or farther from the record-cylinder *d*, so that in reproducing upon the blank *e* the record of the cylinder *d* the reproduction may be commenced at exactly the same distance from one end of the cylinder *e* as the record from the similar end of the cylinder *d*, or if the record on the cylinder *d* does not begin adjacent to the end the reproduction upon the blank *e* may be begun near the end, the said spring or tongue 2 producing sufficient friction or hold upon the cylinder to maintain the same in place and prevent a turning or a longitudinal movement except by greater force than is exerted by the reproducing mechanism.

I have found in the manufacture of blanks for phonograph-cylinders that sometimes the blanks will contract, and consequently when placed upon the sleeve or mandrel it will not pass over the mandrel as far as if the contraction had not taken place, and if the mandrels or sleeves bore a fixed relation to one another it would therefore not be possible to start the reproduction at the same distance from the end of the blank as the record to make the two cylinders agree. This is overcome by the adjustment of the mandrel or sleeve *c* in relation to the sleeve *b*.

The back rod *f* is supported in any desired manner by a suitable frame or foundation,

and the sleeve f' is capable of a longitudinal movement upon the said back rod, and the sleeve g is clamped to the sleeve f' by a set-screw shown. This movement is preferably imparted by the usual screw-feed. The sleeve g carries a curved arm g' , extending over above the shaft and the cylinder, and at the outer end of the said arm g' is an adjusting-bar h , connected to and adjustable upon the said arm by a set-screw. A rest-bar i comes below the adjustable bar h . This rest-bar is a fixture, and the adjustment of the bar h determines, generally, the position of the parts and the relation of the following and reproducing styles to the cylinders. An arm k is secured to the curved arm g' , and it occupies a position transversely to the said arm and parallel with the shaft a and cylinders. The ends of the arm k carry heads 3 4, and pivoted to these heads are the carrier-blocks $l m$, through which there is a central opening in line with the arm k and the shaft a . These carrier-blocks have depending from them arms which serve as pivotal supports for the following style n and the reproducing-style o , and the carrier-block m also has connected to its under side a guide-bar r , the office of which is to rest upon the surface of the blank cylinder e and following the same to give location to the reproducing style o by following the contour of the surface of the blank cylinder. The carrier-block l is provided with an arm 5, bent at the outer end and made tubular to receive the adjustable hook 6, and through the opening in the said carrier-block l is a helical contractile spring 7, one end of which is connected to the hook 6 and the other end to the following-style. The following-style n and the reproducing-style o are each in the form of bell-crank levers pivoted to the supports depending from the carrier-blocks $l m$, and in the opening in the carrier-block m there are an expansible spring 9 and the adjusting-screw 10, and a link or connecting bar 8 extends across between the respective upper ends of the levers of the following and reproducing styles, so as to connect them together positively and to cause any movement of the following-style to be immediately and simultaneously transmitted to the reproducing-style o . The shape and configuration of the points of the following and reproducing styles form no part of the present invention, but are made in the usual and most acceptable form for the purpose to be accomplished.

By means of the screw 10 a pressure is exerted against the spring 9, and by means of the hook 6 a pressure is also applied to the style, so as to cause the same to press to a greater or less extent, as may be necessary, upon the record-cylinder and the blank cylinder, and by reference to Fig. 1 the simultaneous movements of the following and reproducing styles will be appreciated and the fact that the reproducing-style will follow each and every movement upon its pivot of the following-style, and of course the parts

being rigidly spaced apart the grooves upon the respective cylinder and blank will be caused to agree. The pressure upon the following-style is caused and regulated by the movable weights 12 on the threaded arms 11, extending out from opposite ends of the carrier-block l , and the pressure upon the reproducing-style is caused and regulated by the weights 14 upon the threaded ends of the arms 13, extending out from the opposite ends of the carrier-block m .

I claim as my invention—

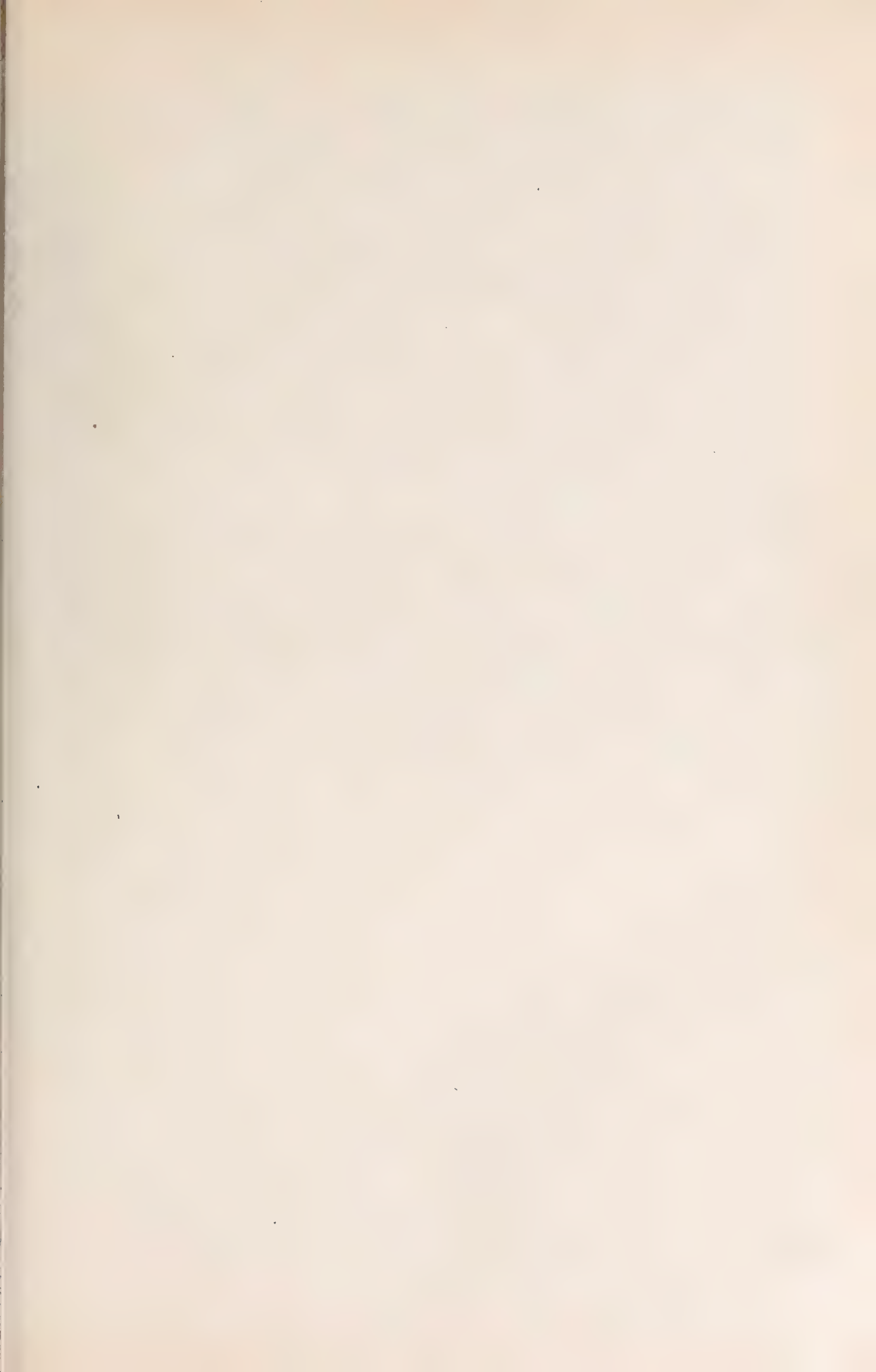
1. In a machine for reproducing phonograph and similar records, the combination with a reproducing device, of a shaft, a fixed sleeve or mandrel thereon to receive the record-cylinder, a removable sleeve or mandrel adjustable longitudinally upon the free end of the same shaft in relation to the fixed sleeve or mandrel and adapted to receive the blank cylinder, and means for holding the removable mandrel in position, substantially as set forth.

2. In a machine for reproducing phonograph and similar records, the combination with a shaft and means for supporting and rotating the same, of a fixed sleeve or mandrel upon the shaft at a distance from the free end of the shaft greater than the length of the sleeve, a removable cylinder or mandrel adapted to be placed upon the free end of the shaft in line with the fixed sleeve or mandrel, the said sleeves or mandrels being tapering and adapted to receive the record and the blank cylinders, a means for frictionally holding the removable cylinder to the shaft as adjusted, a following-style and a reproducing-style connected together, means for supporting the same and for exerting a pressure thereon to cause said styles to work in unison, substantially as set forth.

3. In a machine for reproducing phonograph and similar records, the combination with a recording-cylinder and a blank cylinder in line and upon the same shaft, of a following-style and a reproducing-style and a connection between the said styles and supports therefor whereby the said styles are in line axially with the shaft, means for exerting a pressure upon the following-style to cause it to follow the record of the cylinder and means for exerting a pressure upon the reproducing-style to cause it to cut to a depth in the blank agreeing with the record, and adjustable weights for regulating the pressure applied, substantially as set forth.

4. In a machine for reproducing phonograph and similar records, the combination with a record-cylinder and a blank cylinder in line and upon the same shaft, of a following-style in engagement with the record-cylinder and a reproducing-style in engagement with the blank cylinder, supports therefor and means connecting the following and reproducing styles to cause them to move in unison, substantially as set forth.

5. In a machine for reproducing phono-



graph and similar records, the combination with a record-cylinder and a blank cylinder in line and upon the same shaft, of a support-rod and curved arm pivoted thereto, an adjusting-bar connected to the free end of the curved arm, a fixed rest-bar upon which the adjusting-bar bears, a following and a reproducing style and means for connecting and for supporting and for adjusting the same, substantially as set forth.

6. In a machine for reproducing phonograph and similar records, the combination with a record and a blank cylinder in line, a following and a reproducing style and a connection from one to the other also in line with the said cylinders and supports for the following and reproducing styles, a carrier-block *l* for the following-style and a carrier-block *m* for the reproducing-style to which the said styles are pivoted, said blocks being made centrally and transversely hollow and springs in the said openings in the carrier-blocks and means for applying tension thereto and a guide-bar connected to the carrier-block of the reproducing-style and adapted to bear upon the blank cylinder, substantially as set forth.

7. In a machine for reproducing phonograph and similar records, the combination with a record and a blank cylinder in line, a following and a reproducing style and a connection from one to the other also in line with the said cylinders and supports for the following and reproducing styles, a carrier-block *l* for the following-style and a carrier-block *m* for the reproducing-style to which the said styles are pivoted, said blocks being made centrally and transversely hollow, an arm 5 connected to the carrier-block *l*, a hook 6 adjustable in said arm, a spring 7 in the

opening of the said carrier-block with its respective ends connected to the said hook and to the following-style, a spring 9 in the opening in the carrier-block *m*, an adjusting-screw 10 for exerting a pressure upon the spring 9 and a guide-bar *r* connected to the under side of the carrier-block *m* and resting upon the blank cylinder, substantially as set forth.

8. In a machine for reproducing phonograph and similar records, the combination with a record and blank cylinder in line, a sleeve for the record and a sleeve for the blank cylinder, a shaft on which the same are mounted, and means for revolving the said parts, of a following and a reproducing style and a connection from one to the other also in line with the said cylinders, supports for the said styles, a sleeve on which said supports are mounted, a supporting-shaft and means for progressively moving the said styles and supports over the surface of the record and blank cylinders, substantially as set forth.

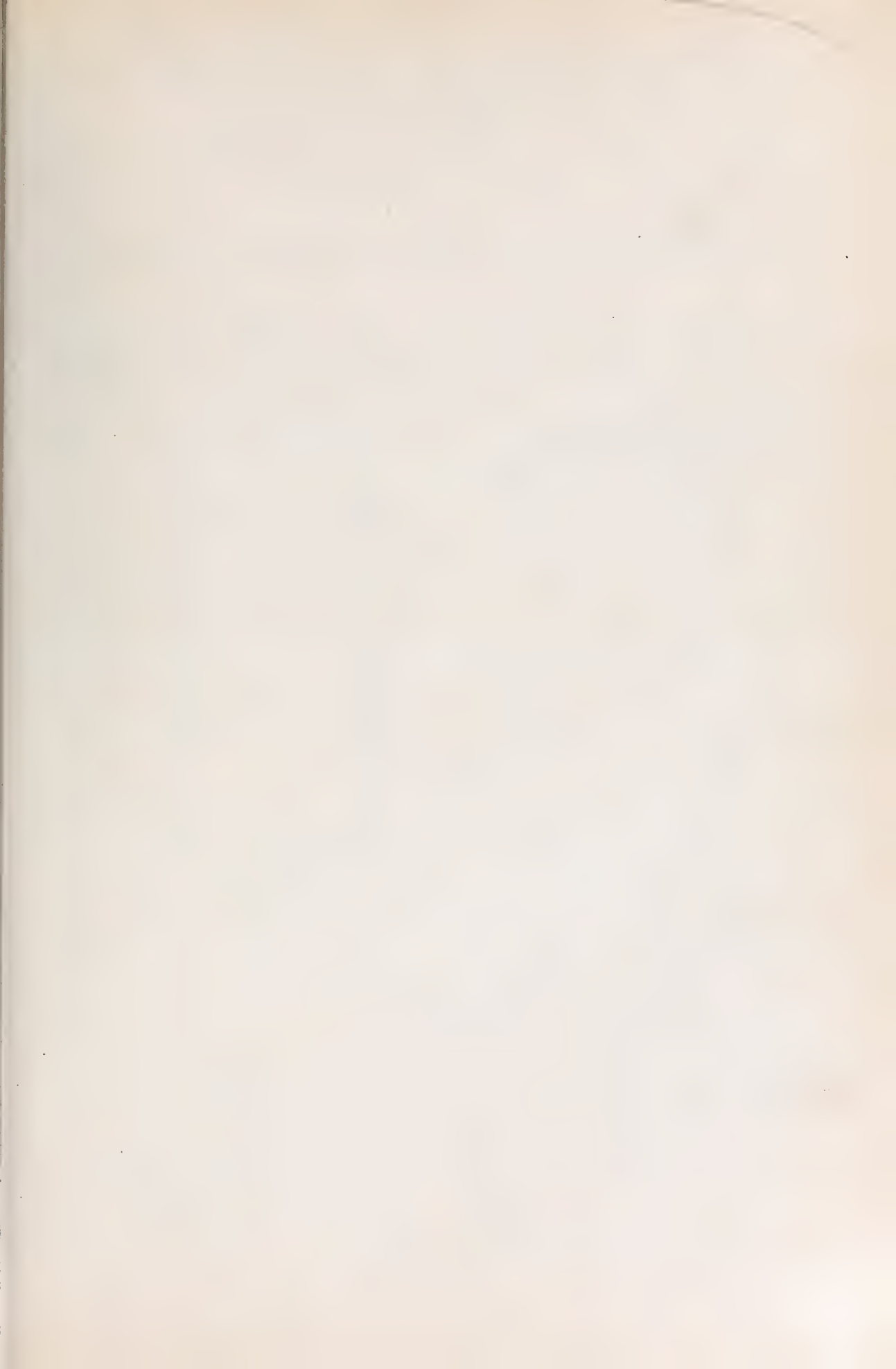
9. In a machine for reproducing phonograph and similar blanks, the combination with a record and a blank cylinder in line, of a style following the impression in the record-cylinder, a reproducing-style connected to the following-style, supports for the said styles and a guide-bar connected to the support of the reproducing-style for controlling the position and the depth of cut produced by the reproducing-style, substantially as set forth.

Signed by me this 17th day of October, 1899.

ADEMOR N. PETIT.

Witnesses:

GEO. T. PINCKNEY,
S. T. HAVILAND.



No. 657,956.

Patented Sept. 18, 1900.

A. N. PETIT.
GRAPHOPHONE CYLINDER.

(Application filed Nov. 15, 1899.)

(No Model.)

Fig. 1.

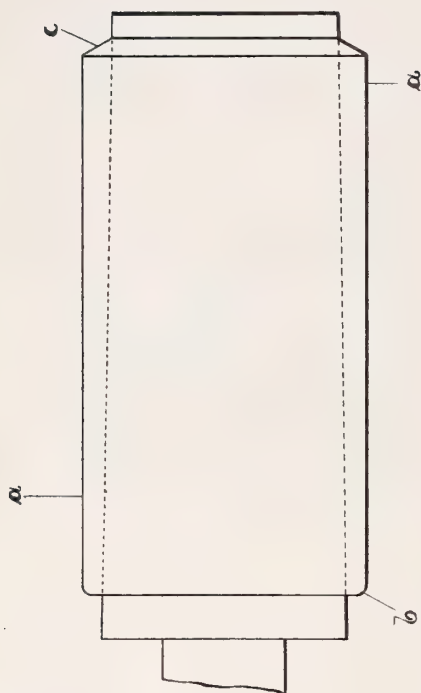
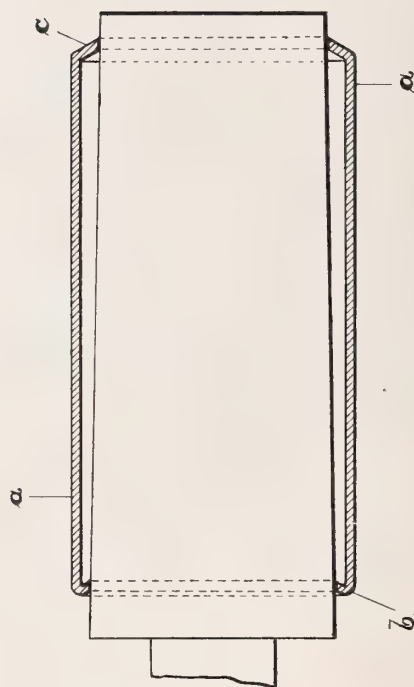


Fig. 2.



Witnesses
a b Terrell
Charles Smith

Inventor
A N Petit
per
L. W. Terrell & Son
Attys

UNITED STATES PATENT OFFICE.

ADEMOR N. PETIT, OF NEWARK, NEW JERSEY.

GRAPHOPHONE-CYLINDER.

SPECIFICATION forming part of Letters Patent No. 657,956, dated September 18, 1900.

Application filed November 15, 1899. Serial No. 737,016. (No model.)

To all whom it may concern:

Be it known that I, ADEMOR N. PETIT, a citizen of the United States, residing at Newark, in the county of Essex and State of New Jersey, have invented a new and useful Improvement in Record-Cylinders for Phonographs, Graphophones, and Similar Instruments, of which the following is a specification.

As heretofore constructed, records or cylinders for phonographs, graphophones, and similar machines have been made from a preparation of wax or similar material. These records have been of considerable thickness and appreciable weight. They have been made with a taper opening through the center to receive and fit upon the taper mandrel of the machine. These records have been of a delicate nature, because they were easily broken and the surface was readily marred or disfigured if accidentally brought in contact with any harder substance. Consequently they had to be very carefully handled, and special devices have been made for receiving, storing, and carrying the said records from place to place.

The object of my invention is to overcome these difficulties.

My invention is a new article of manufacture; and it consists of a cylinder or record of celluloid in which the respective ends are bent inward, so as to leave the opening of a diameter to fit upon the taper mandrel of the machine, and which openings at the ends of the cylinder are of less diameter than the interior diameter of the cylinder. These cylinders are light and strong and the surface is hard and they do not have to be handled with any particular care, and special devices do not have to be provided for storing or carrying about the same.

In the drawings, Figure 1 is an elevation of a cylinder upon the mandrel, and Fig. 2 is an elevation of the mandrel and longitudinal section of the cylinder or record.

The cylinder or record *a* is formed from a tube of celluloid or similar material of an external diameter agreeing with the diameter of the cylinders or records already in use and upon the market. The tube is of sufficient thickness for strength, but is withal exceedingly light, and the interior diameter is somewhat greater than the diameter of the man-

drel at any point. In order that the tube may fit upon the taper mandrels in use and be concentric therewith, the respective ends are softened and are bent inward. The end *b* is inwardly curved and of the greatest diameter, and the end *c* is bent inward in a tapering form, preferably, and is of the lesser diameter. I prefer to bend the ends in in such a manner that the cylinder or record so formed slips readily upon the mandrel of the phonograph, graphophone, or other machine and when in place is held with sufficient friction to prevent any possibility of the cylinder or record slipping on the mandrel. The cylinder or record is produced of one piece of material, the ends being integral and bent inward, preferably of the form shown in the longitudinal section. These cylinders possess lightness and strength and are comparatively inexpensive, and they are not readily broken, and there is a great saving in weight over and above cylinders of ordinary construction.

In my application for Letters Patent, Serial No. 734,933, filed October 27, 1899, I have described the method of and materials for treating the surface of cylinders or record-blanks of this character, so that the record may be impressed upon the surface of the cylinder in the same manner as the record is impressed upon the wax surface of the ordinary cylinder.

I claim as my invention—

1. As a new article of manufacture, a cylinder or record for phonographs, graphophones or similar machines, formed from a tube with the ends integral and bent inward and provided with openings of different diameters, so that they fit upon the taper mandrel of the machine, substantially set forth.

2. As a new article of manufacture, a cylinder or record for phonographs, graphophones or similar machines of celluloid and formed from a tube with the ends integral and bent inward and provided with openings of different diameters so that they fit upon the taper mandrel of the machine, substantially as set forth.

Signed by me this 13th day of November, 1899.

ADEMOR N. PETIT.

Witnesses:

GEO. T. PINCKNEY,
E. E. POHER.

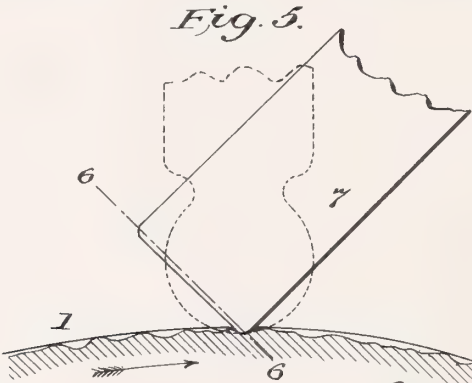
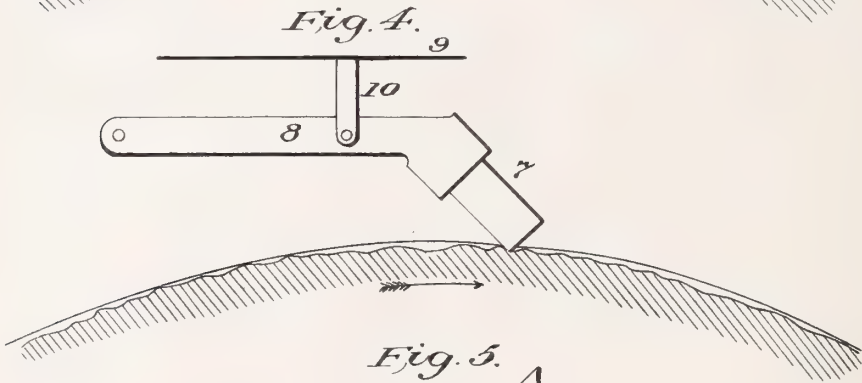
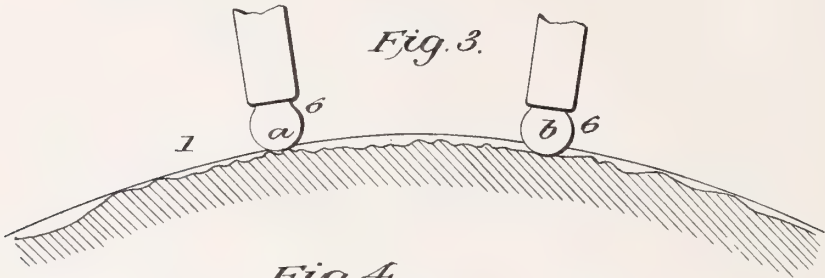
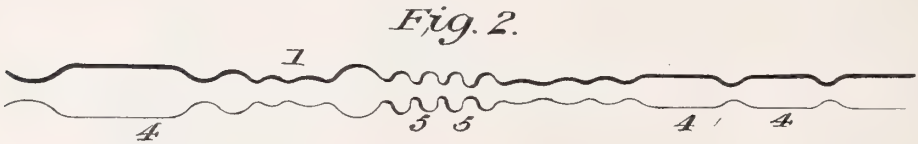
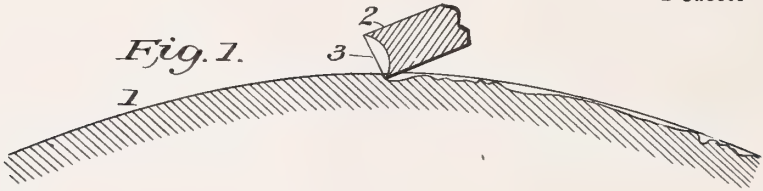
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(re. 11.857.

T. A. EDISON.
PHONOGRAPH.

(Application filed Aug. 18, 1900.)

2 Sheets—Sheet 1.



Witnesses:

Nicholas P. Reese

Geo. R. Taylor

Inventor:

Thomas A. Edison

by *Alfred Edmunds*

T. A. EDISON.
PHONOGRAPH.

(Application filed Aug. 18, 1900.)

2 Sheets—Sheet 2.

Fig. 6.

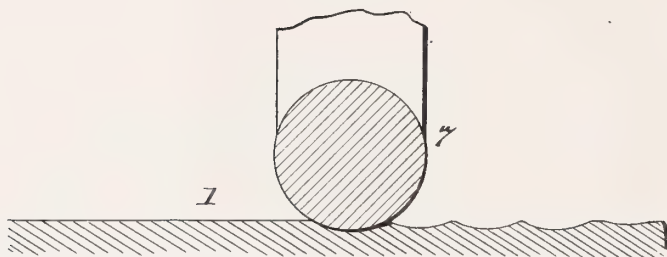


Fig. 7.

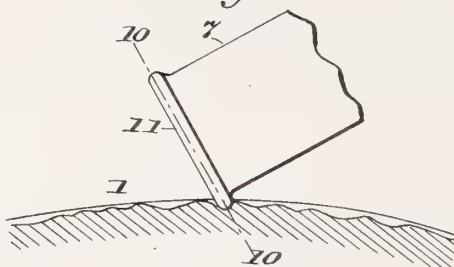
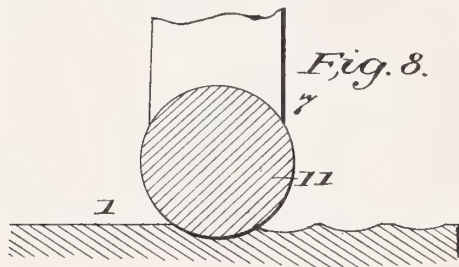


Fig. 8.



Witnesses:

Archibald G. Reese

John R. Taylor

Inventor:

Thomas A. Edison

by
Alfred Edmunds & Sons

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

PHONOGRAPH.

SPECIFICATION forming part of Reissued Letters Patent No. 11,857, dated September 25, 1900.

Original No. 652,457, dated June 26, 1900. Application for reissue filed August 18, 1900. Serial No. 24,246.

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, a citizen of the United States, residing at Llewellyn Park, in the county of Essex and State of New Jersey, have invented a certain new and useful Improvement in Phonographs, (Case No. 1,014,) of which the following is a specification.

My invention relates to improvements in phonographs; and my object is to produce a phonograph wherein the loudness and quality of the reproduction will be increased.

Experience has demonstrated the superiority of the type of recorder described in my Patent No. 430,278, dated June 17, 1890, by which will be obtained a record composed of a series of more or less connected gouges of varying dimensions, all of less depth than width and presenting in cross-section at any point an arc depending in extent upon the depth of cut of the recorder. A record of this character offers a large bearing-surface for the customary spherical reproducing device and causes the latter to track automatically. It is well known that the imperfections in phonographic reproductions are due in part to the fact that the spherical reproducer is not allowed to engage all the portions of the record representing fundamental tones and principal overtones, because some of the waves or gouges thereof are of less length than width. By my present improvement I overcome this objection and obtain a reproducer for use in reproducing from records of the character described and which will automatically track the record-groove and engage all portions thereof representing fundamental tones and principal overtones even when the waves or depressions are greater in width than in length. In this way I am enabled to obtain better reproductions without the necessity of increasing the peripheral speed of the recording-surface. It is obvious that in the operation of the phonograph the formation of such representative waves or depressions having a greater width than length can be avoided by increasing the peripheral speed of the recording-surface and that when the waves are thus always characterized a spherical reproducer can be effectively used; but the increase in speed is objectionable, because the increased pres-

sure imposed on the recording device prevents the latter from responding as sensitively to the sound-vibrations as when a lower speed is employed, and hence even the principal overtones will be in part at least omitted or imperfectly recorded. By means of my present improvement I effect a perfect tracking of the record, not by changing or distorting the record, but by the employment of a reproducer of such a form that it will enter all portions of the record as at present made at the usual surface speeds and which are more nearly graphically representative of the original sounds than are records made at abnormally-high surface speeds.

To this end my invention consists in employing, in combination with a record-groove of the character described, a reproducer presenting in cross-section to the record a curved form not greater than the curve of the cutting edge of the recorder and preferably of a slightly-less radius than that curve and which presents longitudinally of the record a bearing-surface rounded to prevent wear and of a materially-less radius than is presented to the record by the ordinary spherical reproducer. Preferably the specific form of reproducer which I employ is a cylinder inclined to the tangent of a cylindrical phonogram or to the record-surface of a flat phonogram, the bottom edge of the cylinder engaging the groove and said edge being provided with a rounded bead or projecting rib, which engages the record.

In order that my invention may be better understood, attention is directed to the accompanying drawings, forming a part of this specification, and in which—

Figure 1 is a sectional view taken lengthwise of the record-groove, illustrating the manner of forming the record by means of a recorder of the type described in my said patent, the parts being enlarged for the purpose of clearness; Fig. 2, a plan view, on an enlarged scale, of a record-groove produced by a recorder having a curved cutting edge; Fig. 3, a diagram showing in longitudinal section, on an enlarged scale, a portion of a record-groove, at *a* a spherical reproducer engaging with a record-wave of less length than width, and at *b* a spherical reproducer engaging with a record-wave of greater length

than width; Fig. 4, a section longitudinally through the record, on an enlarged scale, showing one form of the improved reproducer engaging with a record-wave of less length than width; Fig. 5, an enlarged section taken longitudinally of the record, showing the improved reproducing device placed in the opposite direction from that shown in Fig. 4 and illustrating in dotted lines the usual spherical reproducing device, whereby a comparison of the two reproducers can be conveniently made; Fig. 6, a section on the line 6 6 of Fig. 5; Fig. 7, a side elevation of the preferred form of the improved reproducer, and Fig. 8 a section on the line 10 10 of Fig. 7.

In all of the above views corresponding parts are represented by the same numerals and letters of reference.

1 represents a phonogram-blank, which is preferably cylindrical in form, of a soap-like composition, as is now common. Flat phonograms may be employed and other materials may be used.

2 represents the recorder of the type described in my said Patent No. 430,278, said recorder having a curved cutting edge 3 and being preferably hollowed out to facilitate the gouging or cutting of the records. With such a device the record will partake generally of the appearance shown in Fig. 2, being composed of a series of more or less connected gouges of varying dimensions, according to the amplitude or extent of movement of the recording-diaphragm and to the rapidity of vibration thereof. Owing to the relatively-great diameter of the recording edge to the depth of cut all the depressions of which the record is formed are characterized by a greater width than depth. Some of these waves—as, for instance, 4 4—are greater in length than width; but others, such as 5 5, are found in practice to be of less length than width. The effect of an attempt to reproduce these records with a spherical reproducer is shown clearly in Fig. 3, wherein two spherical reproducing-balls 6 6 are illustrated. In the case of the waves which are of greater length than width the reproducer, as at *b*, will be free to engage the entire length of the wave; but when the length of the wave is less than its width the spherical reproducer, as shown at *a*, will not be allowed to enter the record-groove, but will be arrested by the crests of the adjacent waves. The reproducer in the latter case, therefore, does not accurately track the record and the reproducer-diaphragm is not vibrated in accordance with the record.

Referring to Fig. 4, 7 represents one form of the improved reproducer, which may be connected directly to the diaphragm or to lever 8, which is connected to the diaphragm 9 by a link 10. The reproducer is preferably cylindrical in form, with its lower edge resting in the groove, the axis of the cylinder being preferably inclined at an angle of about forty-five degrees from the tangent of a cylindrical

record or from the face of a flat record. The reproducer may be inclined in the direction of the movement of the blank, as shown in Fig. 4, or against the movement of the record, as shown in Fig. 5. The curve of the engaging edge of the reproducer, as shown in Fig. 6, is not more than the curve of the cutting edge 3 of the recording device and it is preferably slightly less than that curve, so that the reproducer can always be free to track accurately in the groove. The curve presented by the engaging edge of the reproducer longitudinally of the wave, as shown in Fig. 5, is very much less than is presented by a spherical reproducer, as may be seen from an examination of this figure. Hence a depression or wave which could not possibly be engaged by a spherical reproducer can be accurately tracked by my improved reproducer. At the same time the bearing-surface of the reproducing device is almost as great as that which is presented by a spherical reproducer, so that there will not be any excessive wear. By employing a reproducing device of this general character which will present lengthwise to the wave a very much less surface than is the case with the spherical reproducer I am enabled to accurately track a record even when certain of the waves, or all of them, representative of fundamental tones and principal overtones, are materially less in length than in width, and I therefore do away with the necessity of preventing the occurrence of such waves by operating the phonogram at an abnormally-high speed. It will be understood that instead of using a reproducer which is cylindrical in form any other form of reproducer may be employed presenting a curved surface to the record and with its longitudinal dimensions contracted sufficiently to allow it to enter to the full depth in the record-groove, even when the waves are very short and deep.

The preferred form of the reproducer is shown in Figs. 7 and 8, wherein the reproducer consists generally of a cylindrical shank having a rim 11 at its bottom edge, the curve presented by such rim at right angles to the record being shown in Fig. 8, while the curve which is presented by such rim longitudinally of the record is shown in Fig. 7. It is evident that this form of reproducer can be placed at a less inclination to the record than the form shown in Figs. 4 and 5, and I prefer to support it at no greater inclination to the record than is necessary to enable its holder to clear the record-surface. In all forms of the reproducer which have been illustrated the bearing-surface has a radius which is very much smaller longitudinally of the record than crosswise thereof, and this bearing-surface is one having the same width throughout its length, the length of the bearing-surface being at right angles to the length of the record-groove. The width of the bearing-surface may be reduced to the minimum when the recording-surface is made of a ma-

terial which is sufficiently hard to withstand the scraping action of such a bearing-surface; but with softer recording materials the width of the bearing-surface of my improved re-
 5 producer should be increased to produce the requisite life of the record. I have found, however, that with recording-surfaces made of the soap compositions now commonly used for the cylinders of the phonograph the pro-
 10 portions of width to length shown in the drawings can be employed without excessive wear of the record.

Having now described my invention, what I claim as new, and desire to secure by Letters
 15 Patent, is as follows:

1. In a phonograph, the combination with a phonogram having a record thereon formed of a series of more or less connected gouges or waves with rounded sides and bottom, some of said waves representative of funda-
 20 mental tones and principal overtones being characterized by a greater width than length, of a reproducing device having a curved bearing-surface engaging the bottom and side walls of the record and of a form adapted to enter and accurately track all of such repre-
 25 sentative waves, substantially as and for the purposes set forth.

2. In a phonograph, the combination with a phonogram having a record thereon formed of a series of more or less connected gouges or waves with rounded sides and bottom, some of said waves representative of funda-
 30 mental tones and principal overtones being characterized by a greater width than length, of a reproducing device having a curved bearing-surface which engages the record-groove and reduced in its longitudinal dimension, whereby the reproducing-surface may accu-
 35 rately track a wave having a less length than width, substantially as set forth.

3. In a phonograph, the combination with a phonogram having a record thereon formed of a series of more or less connected gouges or waves with rounded sides and bottom, some of the waves representative of fundamental tones and principal overtones being charac-
 45 terized by a greater width than length and said waves differing from each other in the slope of their descending and ascending walls, of a reproducing device having a curved bearing-surface engaging the sides and bottom of the record and of a form adapted to enter and accurately track all of such representative
 50 waves, substantially as and for the purposes set forth.

4. In a phonograph, the combination with a phonogram having a record thereon formed of a series of more or less connected gouges or waves with rounded sides and bottom, some of the waves representative of fundamental tones and principal overtones being charac-
 60 terized by a greater width than length, of a reproducing device having a curved bearing-surface engaging the sides and bottom of the record to accurately track all of such repre-
 65 sentative waves, said reproducing device being of such a form as not to engage simultaneously the descending and ascending slopes of the waves, substantially as set forth. 70

5. In a phonograph, the combination with a phonogram having a record thereon formed of a series of more or less connected gouges or waves with rounded sides and bottom, some of said waves being characterized by a greater
 75 width than length, of a cylindrical reproducing device placed at an angle to the record and with its lower edge engaging the sides and bottom of the record, substantially as set forth. 80

6. In a phonograph, the combination with a phonogram having a record thereon formed of a series of more or less connected gouges or waves with rounded sides and bottom, some of said waves being characterized by a greater
 85 width than length, of a cylindrical reproducing device having a rounded bottom edge which engages the sides and bottom of the record, substantially as set forth.

7. As a new article of manufacture, an im-
 90 proved reproducer for phonographs, having a curved engaging edge, said edge being curved longitudinally of the record in a smaller radius than at right angles thereto, substan-
 95 tially as set forth.

8. As a new article of manufacture, a cylindrical reproducer maintained in an inclined position and having its bottom edge rounded for engagement with the record, substantially
 100 as set forth.

9. An improved phonograph-reproducer, consisting of a cylinder having at one end a rounded bead or rib, projecting beyond the periphery of the cylinder, which rib forms the bearing-surface of the reproducer, sub-
 105 stantially as set forth.

This specification signed and witnessed this 10th day of August, 1900.

THOMAS A. EDISON.

Witnesses:

J. F. RANDOLPH,
 J. A. BOEHMS.



No. 658,571.

Patented Sept. 25, 1900.

J. W. MOYER.
GRAPHOPHONE POINT.

(Application filed June 22, 1900.)

(No Model.)

Fig. 1.

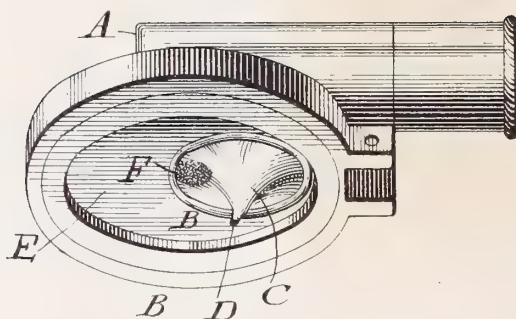
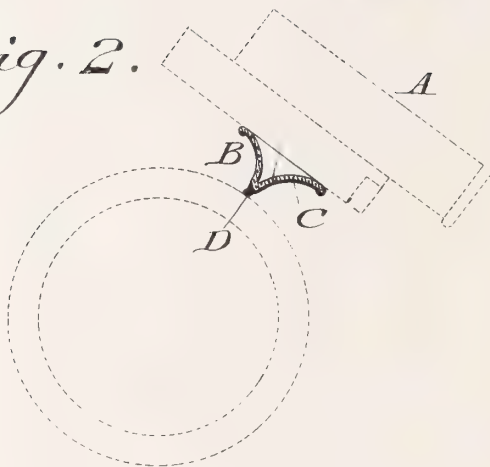


Fig. 2.



Witnesses

O. J. Hagler.
L. Bouville.

By

Inventor
Jay Warren Moyer
Wiedersheim & Fairbank
Attorneys

UNITED STATES PATENT OFFICE.

JAY WARREN MOYER, OF PHILADELPHIA, PENNSYLVANIA.

GRAPHOPHONE-POINT.

SPECIFICATION forming part of Letters Patent No. 658,571, dated September 25, 1900.

Application filed June 22, 1900. Serial No. 21,220. (No model.)

To all whom it may concern:

Be it known that I, JAY WARREN MOYER, a citizen of the United States, residing in the city and county of Philadelphia, State of Pennsylvania, have invented a new and useful Improvement in Styluses for Graphophones, which improvement is fully set forth in the following specification and accompanying drawings.

My invention consists of a stylus for a graphophone, &c., composed of a hollow body and a tip thereon, whereby the sound is increased in volume and made crisp, distinct, and melodious, while harsh and disagreeable vibrations are obviated.

Figure 1 represents a perspective view of a graphophonic reproducer having a stylus embodying my invention applied thereto. Fig. 2 represents a diametric section of the stylus, showing also the reproducer and the record in dotted lines.

Similar letters of reference indicate corresponding parts in the figures.

Referring to the drawings, A designates a reproducer of a graphophone of usual construction.

B designates a stylus, which is constructed of a hollow glass body C, of conical or tapering form, and a glass tip or bulb D, which projects from the apex or point of the body and is set at an angle to said body, so as to be presented to the record at an acute angle, and thus to offer less resistance to the rotation

of the record, the conical or tapering form of the body causing the chamber therein to increase in capacity from the apex to the reproducer. The base of the stylus is secured to the diaphragm E of the reproducer A over an opening F therein, it being evident that when the graphophone is in operation the sound will be sharply taken up from the record by the bulb D and increased, avoiding harshness and the like, the sound being readily transmitted without material resistance to the reproducer through the opening in the diaphragm thereof.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A stylus consisting of a hollow tapering glass body, and a glass tip on the apex thereof.

2. A stylus consisting of a hollow tapering body and a tip on the apex thereof, said tip projecting from said apex at an angle thereto.

3. A stylus consisting of a hollow tapering body, and a tip on the apex thereof in combination with a reproducer and a diaphragm on the latter, said body being secured to said diaphragm and said diaphragm having an opening which is in communication with the chamber of said body.

JAY WARREN MOYER.

Witnesses:

JOHN A. WIEDERSHEIM,
C. D. McVAY.



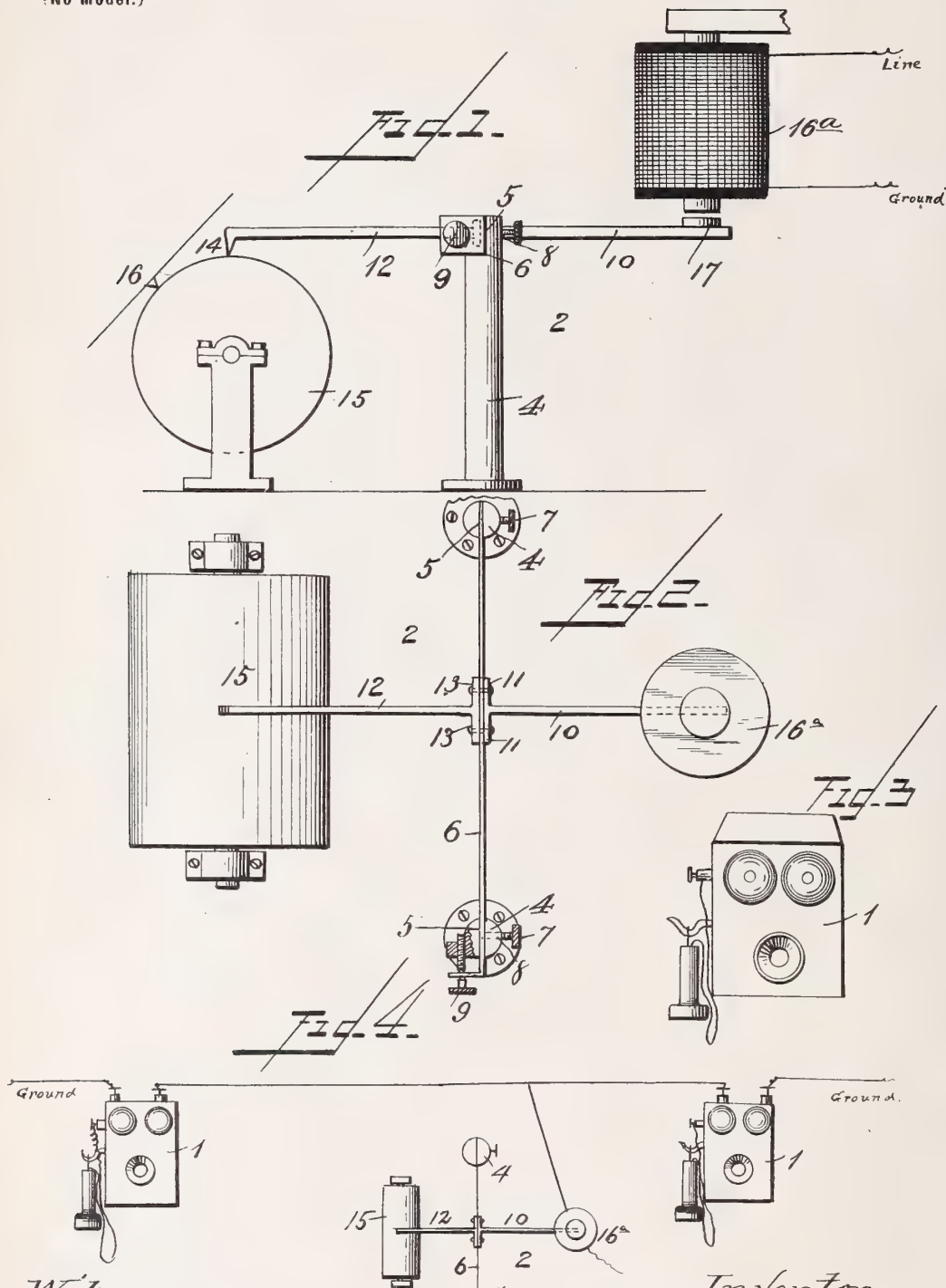
No. 658,862.

Patented Oct. 2, 1900.

E. C. PARAMORE.
TELEGRAPHOPHONE.

(Application filed Nov. 18, 1899.)

(No Model.)



Witnesses:
F. L. Ourand
E. V. Bungea -

Inventor:
Edward C. Paramore
By Louis Ragger & Co.,
Attorneys.

UNITED STATES PATENT OFFICE.

EDWARD C. PARAMORE, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR OF ONE-HALF TO HOWARD T. GOODWIN, OF RIDLEY PARK, PENNSYLVANIA.

TELEGRAPHOPHONE.

SPECIFICATION forming part of Letters Patent No. 658,862, dated October 2, 1900.

Application filed November 18, 1899. Serial No. 737,481. (No model.)

To all whom it may concern:

Be it known that I, EDWARD C. PARAMORE, a citizen of the United States, residing at Philadelphia, (Germantown,) in the county of Philadelphia and State of Pennsylvania, have invented new and useful Improvements in Telegraphophones, of which the following is a specification.

My invention relates to telegraphophones of the type designed to transmit and record an oral message at one end of a telephone-line and record and reproduce the message synchronously at the opposite or receiving end of said line.

The objects of my invention are to provide reliable means for recording and reproducing vocal sounds in a telephone-line, especially of the long-distance type, and to provide an extremely-sensitive torsion-spring for the recording-stylus and to arrange at each end of the line or at intermediate points a transmitting, receiving, recording, and reproducing stylus, each mounted upon a spring of equal tension in order that harmonic relation may be established.

Another object is to provide simple and efficient means for adjusting the tension of said springs, and still another object of my invention is to remedy the defects existing in telephone-lines as at present constructed, especially the defects relating to cross-line interruptions and interferences, and to provide for the recording and reproducing of a message automatically at substantially the same time.

These objects are attained by means of the construction shown in the accompanying drawings, in which—

Figure 1 is a side elevation of the recording and reproducing mechanism. Fig. 2 is a plan view. Fig. 3 is a perspective view of the transmitter or receiving mechanism. Fig. 4 is a diagrammatic illustration of a portion of a telephone system arranged in accordance with my invention.

In said drawings the numeral 1 designates the transmitter, which may be of any ordinary or well-known construction, and arranged at any suitable position near said transmitter is a recorder 2. At the opposite or receiving end of the line a combined re-

recorder and reproducer is employed, and as these two devices at opposite ends of the line are substantially alike in structure the one at the receiving end will be described, since some of the advantages of my invention may be secured without the recorder at the outgoing end of the line.

Suitably mounted upon a base or support 3 are two posts 4 4, provided with slots 5 5 in their upper ends. Seated at its opposite ends in these slots 5 5 is a flat spring 6, which is of the required thickness and width to have a sensitive torsional resilience when given the necessary tension by the set-screws 7 7. These set-screws pass through apertures 8 8 in the posts 4 4 and bear against the side of the spring 6 to hold it firmly in place. A thumb-screw 9 is attached to one post 4, and this thumb-screw is attached to the end of the spring. By turning this screw the tension of the spring is adjusted or regulated. An arm 10 is secured at one end to the spring centrally between the posts. As shown, this arm has oppositely-extending feet 11, riveted to the spring. At a central point opposite the arm 10 an arm 12 is secured to the spring by the same rivets which attach the arm 10 to said spring. The arm 12 is also provided with oppositely-extending feet 13, and the two arms 10 and 12 are thus held in alinement and rigidly attached to the spring 6 at opposite sides thereof. A stylus 14 is formed on or attached to the end of arm 12, and the point of the stylus rests upon a record tube or disk 15, properly journaled and connected to revolve during the operation of the stylus. A reproducer 16 of any well-known or preferred form is superposed above the tube or disk 15 at a slight distance from the stylus in order that the message may be produced immediately after it is recorded on the tube or disk, and the arrangement is such that the reproducer will commence to deliver the message about the time two words have been recorded, as will be readily understood upon reference to the drawings. The outer end of the arm 10 is located in juxtaposition under the electromagnet 16^a, and an armature 17 is attached to said arm, which repeats the vibrations of the transmitter. The recorder 2 hereinbefore referred to may be used,

if desired, to record outgoing messages and to also receive the incoming responses, and it will be understood that this recorder is of the same general construction as that already described.

The operation of my device is as follows: A message sent through the transmitter 1 is communicated to the recorder 2 and simultaneously over the line to the combined recorder and reproducer at the receiving end. The springs 6 of both recorders are adjusted to have substantially the same tension to be in harmonic accord and to be extremely sensitive and responsive. The torsional vibrations of these springs give the necessary movement to the styluses and result in a perfect record.

My device is particularly desirable for long-distance lines, avoiding cross-line interruptions and leaving a record of the message, which can be reproduced at any time should the person to whom it was addressed be absent at the time the message is sent.

It will be understood, of course, that the recording device which I have disclosed may be used in other relations than those shown, and I do not therefore wish to be restricted in this particular.

Having thus described my invention, what I claim is—

In a recorder for sound-reproducing instruments, a flat torsion-spring secured at its ends in slotted posts, set-screws to hold said spring in the posts, and a set-screw for adjusting the tension of said spring, in combination with a stylus-arm attached to said spring and an arm carrying an armature also attached to said spring, substantially as described.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

EDWARD C. PARAMORE.

Witnesses:

FRANK B. WAGNER,
S. HORACE MYERS.



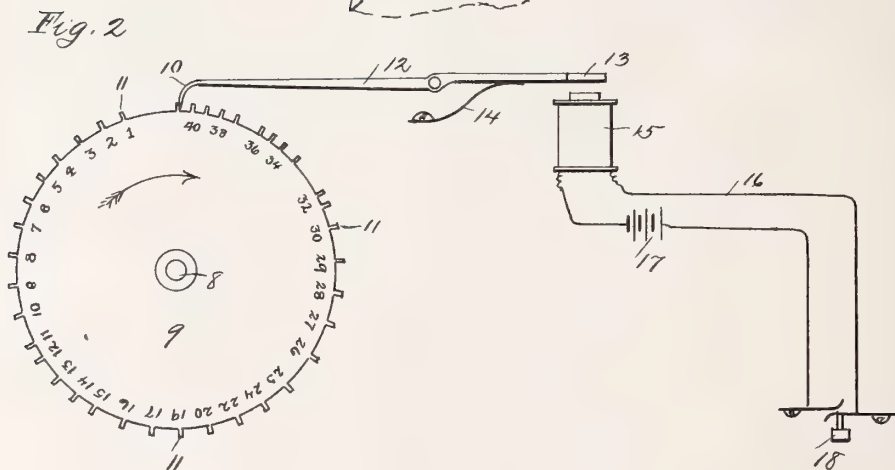
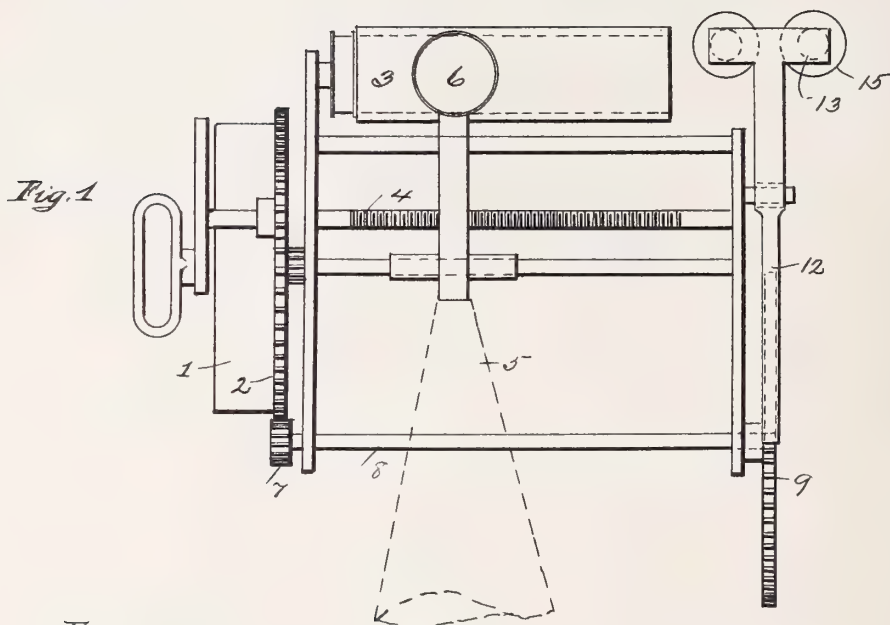
No. 659,011.

Patented Oct. 2, 1900.

A. C. WOLFE.
PHONOGRAPHIC ENUNCIATOR FOR CARS.

(Application filed Dec. 26, 1899.)

(No Model.)



WITNESSES:

A. C. Wolfe
J. A. Perry

INVENTOR.

A. C. Wolfe

By *O. B. Lewis*

att'y

UNITED STATES PATENT OFFICE.

ANDREW C. WOLFE, OF FREEPORT, PENNSYLVANIA, ASSIGNOR OF ONE-THIRD TO JOSEPH F. HEWITT, OF ALLEGHENY, PENNSYLVANIA.

PHONOGRAPHIC ENUNCIATOR FOR CARS.

SPECIFICATION forming part of Letters Patent No. 659,011, dated October 2, 1900.

Application filed December 26, 1899. Serial No. 741,546. (No model.)

To all whom it may concern:

Be it known that I, ANDREW C. WOLFE, a citizen of the United States of America, residing at Freeport, (Freeport post-office,) in the county of Armstrong and State of Pennsylvania, have invented certain new and useful Improvements in Enunciators for Street-Railway Cars and other Purposes; and I do hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawings, which form a part of this specification.

My invention relates to an improved enunciator for street-railway cars and other purposes; and it consists in a graphophone suitably mounted, the record-cylinder of which is used for announcing stations, street-crossings, and various points of interest along the line of railway, a means under the control of the conductor to stop and start the apparatus, together with the certain details of construction and combination of parts, as will be fully described hereinafter.

In the accompanying drawings, Figure 1 is a front elevation of an ordinary graphophone or similar instrument, to which is connected a means for stopping and starting the same, the movement of which is regulated to correspond to the number of words announced, the same being arranged in accordance with my invention. Fig. 2 is an end elevation of the device for controlling the movement of the record-cylinder.

To construct an enunciator in accordance with my invention, I provide a graphophone or other similar instrument, consisting of the motor 1, the record-cylinder 3, the driving-shaft 4, the reproducer 6, the horn 5, and other well-known parts common to this class of machines not necessary to enumerate. I attach to the frame a shaft 8, having a small pinion 7, meshing with a large driving-gear 2 and also fitted with a large disk or wheel 9. This disk 9 is formed with a number of peripheral projections or teeth 11, arranged at irregular intervals, the space between each proportioned to the number of words required to announce the station or place of interest to the passengers. Pivoted to the frame of the phonograph is a lever 12, one end 10 bent to engage with the teeth 11 of the wheel and the other provided with an armature 13 and the said armature fitted with a spring 14 to keep the lever 12 at all times in contact with

the disk 9. Arranged beneath the armature 13 is a pair of magnets 15, connected by wires 16 to a battery 17 and to a push or contact button 18.

In operation a record of all the stations, crossings, and points of interest to the passengers being placed upon the record-cylinder 3 in the usual manner and the disk divided by the projecting teeth 11 and its motion stopped at the end of each separate announcement, which will necessitate the spacing of the said teeth at irregular intervals, as shown on the drawings. Upon approaching a crossing the conductor presses the contact-button 18 to complete the circuit to the battery 17, which energizes the magnets 15, drawing the armature 13 downward, thereby elevating the lever-point 10 over its engaged tooth 11 and allowing the record-cylinder 3 to revolve until the said point is engaged with the next tooth 11 of the disk 9. During this movement of the record-cylinder the instrument has announced the station, crossing, or place of interest corresponding to the number of the tooth.

The one record-cylinder 3, if not sufficient, may be replaced by a second or third to cover the trip and return.

The advantage of this enunciator is that the stations, &c., may be announced in any language or in two or more languages and keep the passengers posted and will be found particularly useful in cosmopolitan cities or in cities entertaining a large number of foreigners.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

In combination with a graphophone or other like machine, the record-cylinder 3 the disk 9 for governing the movement of the said record-cylinder, the said disk being provided with a series of peripheral teeth 11, arranged at irregular intervals, the space between being proportioned to the number of words used in making the announcement, as and for the purpose described.

In testimony whereof I have hereunto affixed my signature in the presence of two subscribing witnesses.

ANDREW C. WOLFE.

Witnesses:

JOHN GROETZINGER,
H. BECSER.



No. 659,028.

Patented Oct. 2, 1900.

B. B. HILL.
PHONOGRAPH.

(Application filed Mar. 10, 1899.)

(No Model.)

Fig. 2.

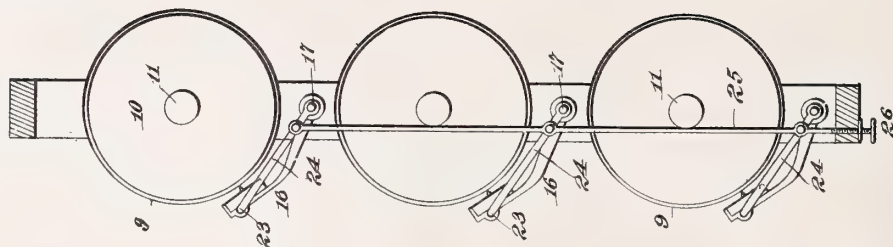


Fig. 1.

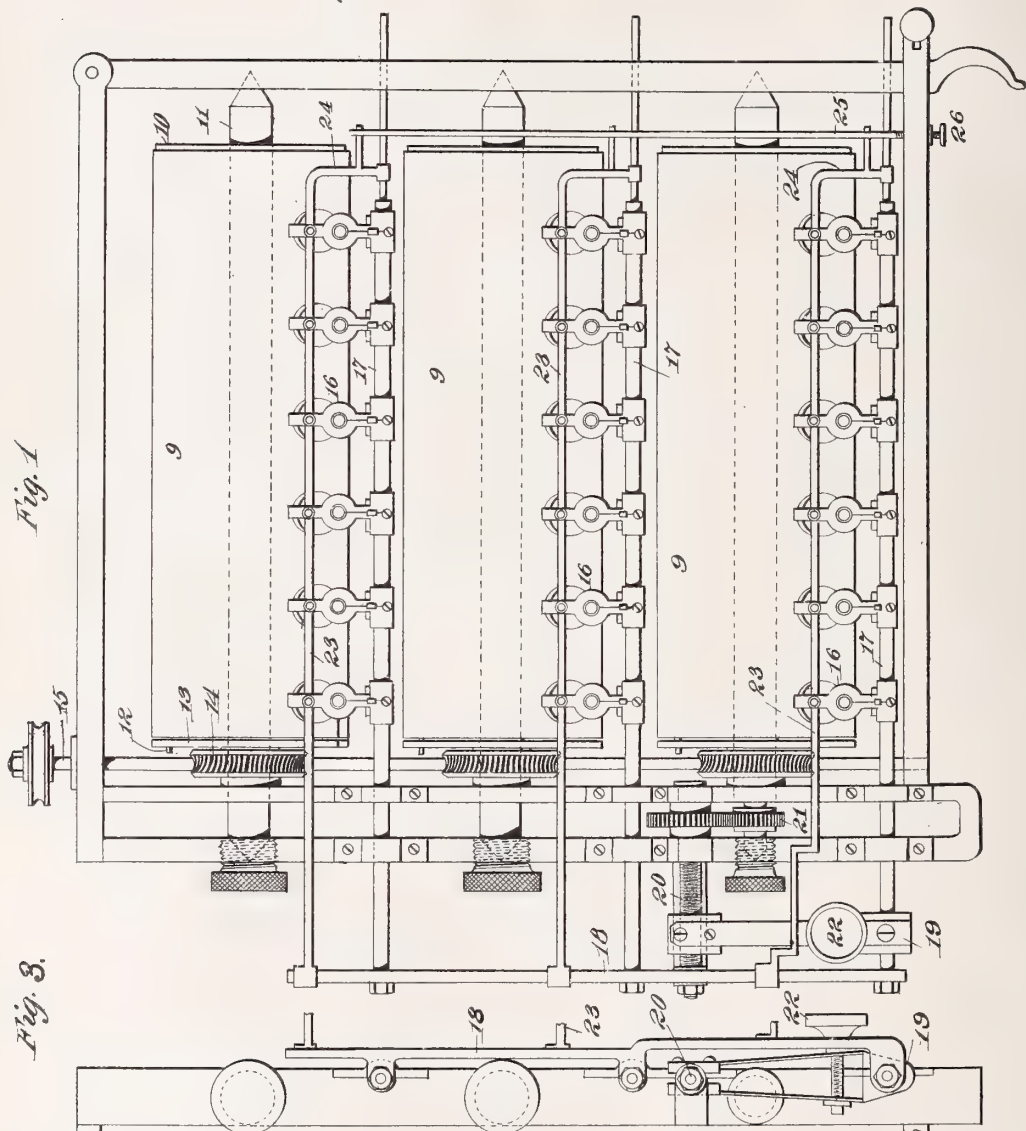
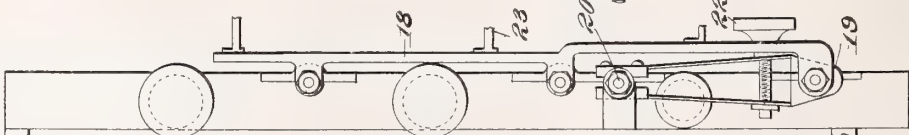


Fig. 3.



Witnesses:

Jas. F. Coleman
Jno. R. Taylor.

Inventor

Barton B. Hill
by H. J. Lee, Edward R. Lee

Att'ys

UNITED STATES PATENT OFFICE.

BARTON B. HILL, OF PARIS, FRANCE.

PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 659,028, dated October 2, 1900.

Application filed March 10, 1899. Serial No. 708,570. (No model.)

To all whom it may concern:

Be it known that I, BARTON B. HILL, a citizen of the United States, residing at Paris, France, have invented certain new and useful Improvements in Phonographic Records and Apparatus for Producing the Same, of which the following is a specification.

My invention relates to improved phonographic records adapted particularly for the reproduction of band, orchestral, or other multiple instrumental or vocal music in a better, clearer, and more satisfactory manner than is now possible. Owing to the extremely-sensitive and complex character of the sound-vibrations representing the kind of music referred to, it is impossible to effect an accurate reproduction thereof with an ordinary phonograph or similar device, the reproduction effecting only the general impression of the music, the predominating instruments being recognizable at intervals. I have invented an apparatus for the recording of band, orchestral, or multiple instrumental or vocal music in a new way for the production of absolutely-perfect results, and in the operation of that apparatus I obtain a phonographic record of novel character. What I propose to do in carrying out my invention is the simultaneous recording phonographically of the individual instruments or pieces of a band or orchestra, each instrument making its own simple record or a less number of instruments than the entire aggregate making together a complex record, preferably the former, and the simultaneous reproduction from the record so obtained, whereby the original vibrations will be reproduced perfectly and without confusion.

The apparatus is capable of being used in connection with any suitable kind of recording-surface; but I preferably utilize a recording-surface of a waxlike or soaplike nature, the sound-record being cut therein, as in the present forms of phonograph.

In the accompanying drawings, forming a part of this specification, and to which reference is made for a better understanding of my invention, Figure 1 is a plan view of a phonographic apparatus embodying my present improvements, showing three cylinders and eighteen recording devices; Figs. 2 and

3, end views of the cylinder apparatus shown in Fig. 1.

In all of the above views corresponding parts are represented by the same numerals of reference.

In Figs. 1, 2, and 3 the apparatus is provided with three very large record-cylinders 9 9 9, each carried on a mandrel 10, mounted on a shaft 11, provision being made for the removal of the cylinders as in ordinary phonographs. In order that the cylinders may be adjusted with absolute accuracy upon the mandrel, each cylinder is provided with a pin 12 in its edge for engaging a slot in a plate 13, carried by the shaft 11. In this way the record-cylinders may be adjusted with absolute accuracy and placed in the apparatus. The cylinders are driven in any suitable way—as, for instance, through worm-gears 14 from a shaft 15, as shown. The recording devices 16, of any suitable character, eighteen in number, are arranged in three rows of six each. These recorders are pivoted on the shafts 17, connected together by a cross-bar 18, adapted to be fed by a feed-arm 19, engaging a feed-screw 20, driven by gears 21 from one of the shafts 11. The feed-arm 19 is composed, preferably, of two leaf-springs held together by a thumb-screw 22, which may be released to disengage the nut from the feed-screw 20, when the recorders are to be returned to their normal position. The forward ends of the recorders are carried on rods 23, which rest normally at their inner ends on the bar 18. Each of the rods 23 is provided with a downturned arm 24, to which a release-arm 25 is connected, operated by a screw 26. By operating the release-arm 25 the arms 24 will be simultaneously moved to withdraw all of the recorders from engagement with the respective cylinders, as will be understood.

In the apparatus shown in Figs. 1, 2, and 3 the individual records are made on the cylinders, all of the recording devices being fed simultaneously, so as to make a series of spiral record-grooves in each of the cylinders. Having obtained a record cylinder or cylinders with a series of records therein representing the vibrations generated by a plurality of instruments, reproduction is effected in any suitable way—for instance, by an apparatus

similar to the recording device, with the exception that reproducing-diaphragms will be made use of instead of the usual recorders.

It will be of course understood that my improved apparatus may be used for the recording and reproduction of multiple vocal music—such as duets, trios, quartets, choruses, choirs, &c.—the individual voices being recorded on the separate recording devices or the sets of voices (the sopranos, tenors, contraltos, bassos, &c.) being recorded on the individual recorders.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is as follows:

1. Apparatus for recording phonographically orchestral, band or multiple instrumental music, comprising a plurality of record-cylinders, a series of phonographic recording devices coöperating with each cylinder, means for relatively moving the cylinders and recording devices, whereby a series of spiral records will be formed on each cylinder, and means for simultaneously moving the recording devices toward and away from said cylinders, substantially as set forth.

2. In apparatus for recording phonographically orchestral, band or multiple instrumental music, the combination of a series of cylinders, a series of recording devices coöperating with each of said cylinders, means for simultaneously moving all of the recording devices with respect to the cylinders,

whereby a series of spiral records will be formed on each of said cylinders, and means for simultaneously moving all of the recording devices toward or away from the respective cylinders, substantially as set forth.

3. Apparatus for recording phonographically orchestral, band or multiple instrumental music, comprising in combination a plurality of record-cylinders, a plurality of recording devices coöperating with each cylinder, a frame movable laterally with respect to the cylinders and carrying said recording devices, means for rotating the cylinders, and means for simultaneously moving said frame laterally, substantially as set forth.

4. Apparatus for recording phonographically orchestral, band or multiple instrumental music, comprising in combination a plurality of record-cylinders, a plurality of recording devices coöperating with each cylinder, a frame movable laterally with respect to the cylinders and carrying said recording devices, means for rotating the cylinders, means for simultaneously moving said frame laterally, and means for simultaneously moving the recording devices toward and away from the cylinders, substantially as set forth.

This specification signed and witnessed this 17th day of February, 1899.

BARTON B. HILL.

Witnesses:

EDWARD P. MACLEAN,
JOHN S. ABERCROMBIE.



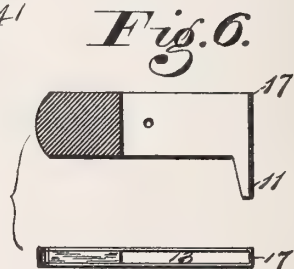
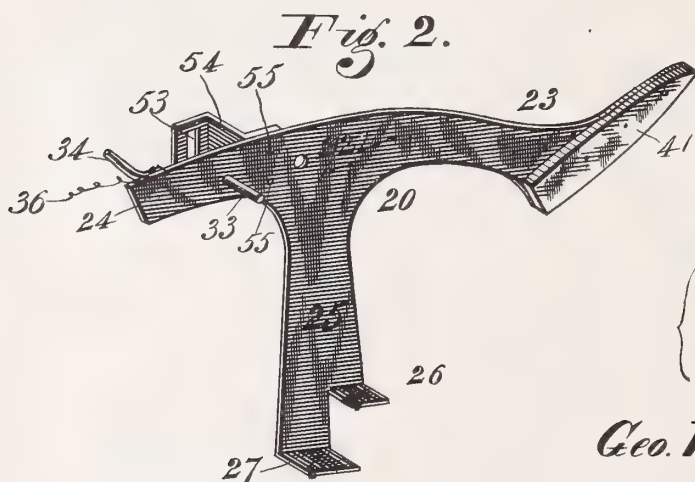
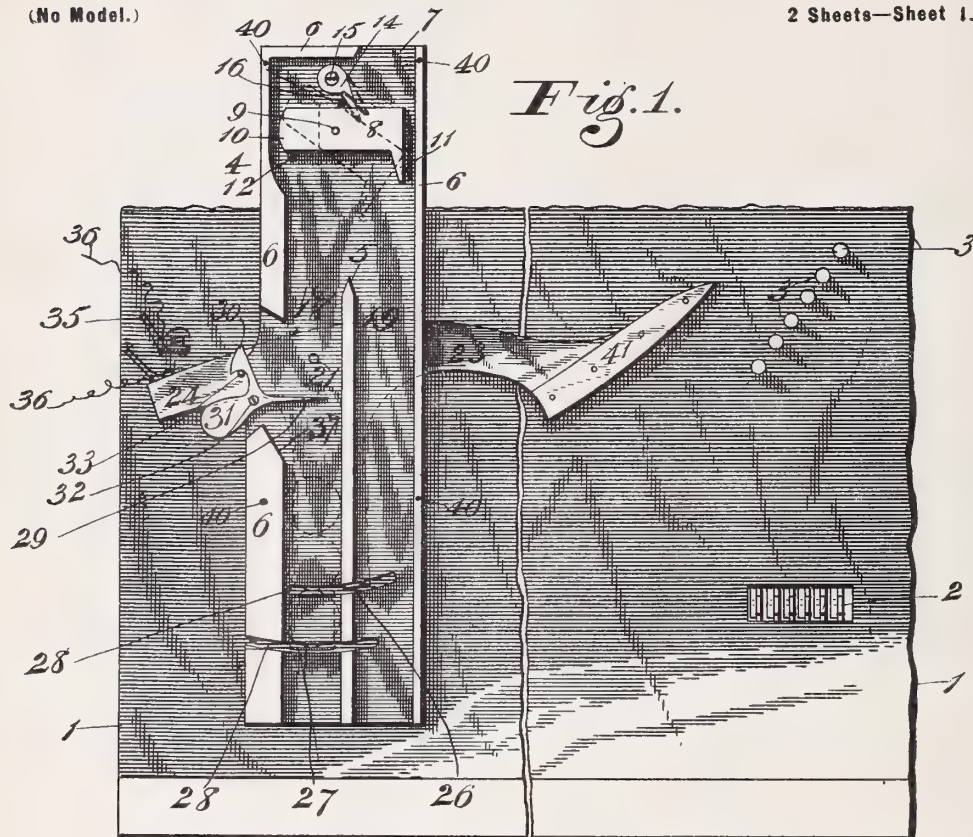
G. W. GOMBER.

COIN CONTROLLED MECHANISM FOR PHONOGRAPHS, &c.

(Application filed Mar. 18, 1899.)

(No Model.)

2 Sheets—Sheet 1.



Geo. W. Gomber.

Inventor

Witnesses

E. C. Overholt
A. H. Miller.

By
W. J. Fitzmaurice
Attorneys



No. 659,661.

Patented Oct. 16, 1900.

G. W. GOMBER.

COIN CONTROLLED MECHANISM FOR PHONOGRAPHS, &c.

(Application filed Mar. 18, 1899.)

(No Model.)

2 Sheets—Sheet 2.

Fig. 3.

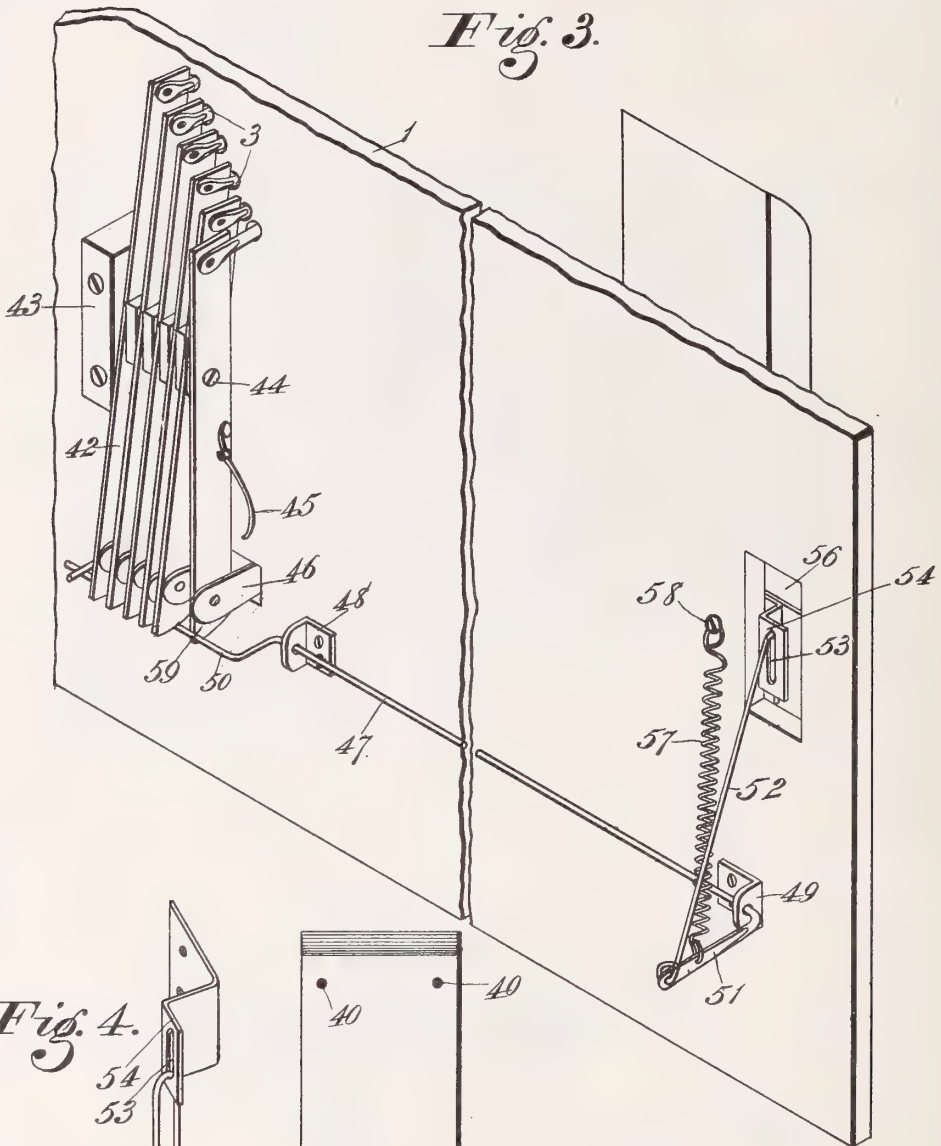


Fig. 4.

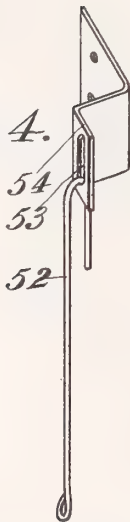
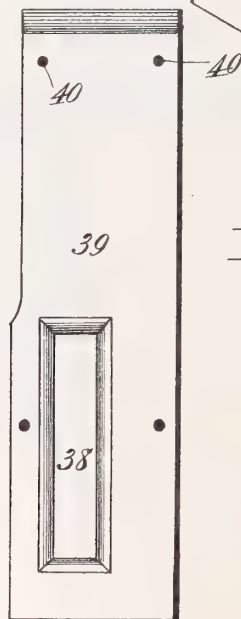


Fig. 5.



Witnesses

E. C. Overholt
A. H. Miller.

George W. Gomber
Inventor

By
W. F. Fitzmaurice
Attorney

UNITED STATES PATENT OFFICE.

GEORGE W. GOMBER, OF CONYNNGHAM, PENNSYLVANIA, ASSIGNOR, BY
MESNE ASSIGNMENTS, TO THE AMERICAN MULTIPLEX TALKING
MACHINE COMPANY, OF WEST VIRGINIA.

COIN-CONTROLLED MECHANISM FOR PHONOGRAPHS, &c.

SPECIFICATION forming part of Letters Patent No. 659,661, dated October 16, 1900.

Application filed March 18, 1899. Serial No. 709,611. (No model.)

To all whom it may concern:

Be it known that I, GEORGE W. GOMBER, a citizen of the United States, residing at Conyngham, in the county of Luzerne and State of Pennsylvania, have invented certain new and useful Improvements in Coin-Controlled Mechanism; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention appertains to coin-controlled mechanism which, while primarily designed to be used in coöperation with phonographs or talking-machines, will be found equally efficient and desirable when used with any of the vending-machines as at present or otherwise constructed, the construction involved in the coin-controlled mechanism proper requiring no modification to render it ready for such varied uses, it being hereinafter made clearly apparent that the only change necessary to accommodate my coin-controlled apparatus for use upon other than a talking-machine applies to an extension or arm designed to contact with a movable part of the mechanism with which it coacts.

The object of my invention, as will be hereinafter made fully apparent, is to produce a coin-controlled device which will at all times reliably perform its office and which may be instantly adjusted so that it will be controlled by a coin of varying size.

The invention set forth in this application is designed as an improvement upon the coin-controlled apparatus fully described and claimed by me in my application for Letters Patent of the United States, Serial No. 655,267, filed October 15, 1897, and it will be seen by comparison of the details of construction that the parts herein set forth have been greatly simplified and that many of the parts described in the above-mentioned application have been wholly eliminated, thus rendering the present device much more simple in its character and cheaper in construction.

Other advantages will be fully developed and made clear by reference to the accompanying drawings, in which—

Figure 1 is a front elevation of my coin-con-

trolled apparatus, showing the front portion thereof removed and also showing a portion of the back part of the casing of a phonograph and the buttons and tumblers designed to control the talking-machine, which this form of coin-controlled mechanism is especially designed to actuate and control. Fig. 2 is a perspective detail of the main portion of the coin-controlled mechanism shown in Fig. 1 separated from its coöperating accessories. Fig. 3 is a perspective view of the reverse side of Fig. 1, illustrating details of construction which render the coin-controlled device as disposed in coöperative relationship with the stops or buttons and the levers controlled thereby as designed for use upon a talking-machine. Fig. 4 is a detail perspective view of part of the mechanism shown in Figs. 2 and 3 separated from the other parts. Fig. 5 is a front elevation of the lid or front portion of the casing, upon a reduced scale, designed to complete the coin-controlled device shown in Fig. 1. Fig. 6 shows details of construction involved in my coin-directing member shown in dotted lines in operative position in the extended top of Fig. 1.

By reference to Figs. 1 and 2 it will be observed that the principal element comprised in my coin-controlled mechanism consists of a pivoted member of peculiar shape so mounted in position that it will be actuated by the weight of a coin and that said coin will be held for a certain time in plain view of the operator, and in order that all the details of my invention and their correlatives or accessories may be individually pointed out said parts will be designated by numerals, of which 1 shows a portion of the casing of a phonograph or talking-machine, 2 indicating the tumblers for controlling the rotation of the tablet-magazine, while 3 represents the actuating-buttons, each of which parts will be hereinafter more fully described.

Upon a convenient point of the casing 1, preferably upon the left end thereof, I secure thereto in any preferred way the member or body-section or chute 4, which is provided with the partition wall or rib 5 and the side and end flanges or ribs 6, the latter being cut away for a portion of its extent, thereby form-

ing the coin receptacle or mouth 7, while pivotally secured in position within the upper end of the opening or recess formed by said flanges is the coin-directing member 8, held in its operative position as by the pivot-point or lug 9.

It will be observed that the coin-directing member 8 is provided with a solid end 10 and upon its opposite end with the depending guiding-section 11, and as the weighted end 7 is heavier than the opposite end thereof the coin-directing member is held normally in a horizontal position owing to the location of the lug or post 12.

By reference to Fig. 6 it will be observed that the lighter end of the member 8 is hollow or provided with the vertical opening 13 of sufficient size to freely permit a coin to pass downward through the same, and in order to insure that the coin thus disposed shall so act that it will elevate the weighted end 10 and incidentally depress the lighter end I insure that said coin shall be brought in contact with said lighter end, which I accomplish by means of the guiding-finger 14, held in position in the path of the coin by means of the set-screw 15, a stop-pin 16 being so mounted in position that the downward sweep of said finger will be circumscribed. It is apparent that the guiding-finger 14 can be adjusted to any desired position by means of the set-screw 15. By this construction just described of the coin-directing member 8 it is clear that by a proper adjustment of the finger 14 the coin cannot drop freely downward through the opening 13, since the coin will contact with said finger and with the extreme end 17, and thereby cause the downward sweep of said end until it has moved sufficiently far away from the end of said finger to permit it to pass between the end thereof and the end 17, when said coin will be directed into the throat 18, instead of passing directly downward into the throat 19 upon the other side of the rib 5, the extreme end or guiding-section 11 of the member 8 also tending to facilitate the delivery of the coin into the throat 18, said end 11 being at this position of the directing member obliquely disposed with respect to the throat 18, as shown by dotted lines. It will therefore be obvious that in case a smaller coin than that designed to actuate the device is used it will drop straight downward through the opening 13, and thence into the throat 19 and into the cash-box without in any wise disturbing the position of the member 8.

The back portion of the body-section or chute 4 is sufficiently recessed or cut away to provide that the actuating member 20 may be pivotally mounted between said body-section or chute and the casing 1, as by means of the bolt or screw 21. The actuating member 20, it will be seen, consists of the body portion 22, the right and left lateral extensions 23 and 24, respectively, and the depending arm 25, the latter having the graduated

lips or guiding-fingers 26 and 27, the latter being designed to extend freely through the radially-disposed slots 28, provided in the body-section or chute 4, near the lower end thereof, and inasmuch as said fingers 26 and 27 are upon opposite sides of a vertical plane they will occupy different positions, while operatively disposed with respect to the throats 18 and 19, as will be hereinafter more particularly pointed out.

Designed to coöperate with the actuating member 20 is the counterpoised trigger, consisting of the trigger proper, 29, the hook-section 30, and the weighted or counterpoising extension 31, the trigger thus formed being pivotally held in position upon the edge of the body-section or chute 4 by means of the screw or bolt 32, as clearly shown in Fig. 1. The hook-section 30 is adapted to engage the pin or stop 33, secured to the lateral extension 24, near the outer end thereof, and thereby hold the actuating member in the position illustrated in Fig. 1, or in position ready to receive the next coin. Any suitable means for closing and breaking a circuit may be so disposed that the movement of the lateral extension 24 may be utilized to the best advantage, and for the purpose of this application I have shown an extension or finger 34 as secured to the lateral extension 24 and designed to contact with the similarly-constructed finger 35, secured to the casing 1, said fingers constituting the ends of an electric circuit, as indicated by the wires 36, and when said fingers are brought together will insure that said circuit will be closed and the motor thereby placed in connection with its battery and the talking-machine or other mechanism coöperating with said parts started in the performance of its work. By thus disposing the trigger proper, 29, in the path of the coin as it falls down the throat 18 I insure that the weight of such coin will cause said trigger to move downward sufficiently to contact with the beveled face 37, and thus be disposed out of the way of the coin and permit it to continue upon its downward course until it comes in contact with the finger 26, when the coin will be checked and held in plain view of the operator through the opening 38, formed in the front portion 39 of the coin chute or body 4, it being understood that said front portion may be held in position, as by screws passing through the apertures 40, formed therein and also provided in the body-section 4.

The parts as illustrated in Fig. 1, it will be seen, are disposed in position ready for the reception of a coin which may be dropped into the opening 7 and will thence pass into contact with the member 8 and the finger 14, swinging the front end of said member downward until it has assumed the position indicated by the dotted lines, which will cause the coin to be directed into the throat 18, the upper end of the rib 5 being tapered to facilitate this movement of the coin, which will

then strike the trigger 29 and release the hook-section 30 from its engagement with the post of stud 33, and thereby permit the weight 41 to assert itself and swing the entire member 20 upon its pivot-post 21, and thereby bring the finger 26 into the path of the falling coin, thus checking further downward movement of said coin until the weighted end 41 is again raised, as by the movement of the diaphragm-carriage or by the contact of an arm mounted on said carriage, as will be more readily understood by reference to my former application above specifically referred to.

The throat 19 is provided for the reception of a coin other than that designed to actuate the member 8, as a coin of smaller size will not contact with the guiding-finger 14, but will drop straight downward into the throat 19 and be thus kept out of contact with the trigger-section 29, the result being that the parts of my coin-controlled apparatus will remain unaffected, though said coin will be passed into the cash-box via the throat 19.

The underside of the weighted section 41 is preferably provided with a curved face to insure that it may be accurately lifted by the movement of the carriage as it travels back to the initial point. When the weight is completely elevated, the hook-section 30 will by reason of the weight 31 be brought into engagement with the post or stud 33, and thus hold the weight 41 in an elevated position until the next coin is placed in the opening 7, when the operation will be repeated, it being understood that the preferable construction of the front part of the casing 39, forming a cover for the body-section 4, shall be provided with an opening of sufficient extent to enable two or more coins to be disposed always in view through the opening 38.

The rib 6, adjacent to the trigger, is preferably cut away to permit the free play of the latter in the performance of its work, and in order to illustrate how easily my coin-controlled apparatus may be placed in coöperation with a talking-machine mechanism attention is called to Fig. 3, in which it will be seen that the series of buttons 3 extend entirely through the casing 1 and are pivotally secured to their respective levers, (designated by the numeral 42,) all of said levers being held normally outward at their lower ends by means of the individual spring 45, provided for each of said levers.

Pivotally secured to each of the lower ends of the levers 42 is an individual tumbler 46, which extends loosely through an opening in the casing 1 and is designed to engage its respective slot or opening provided in the head of the magazine, as set forth in my application above referred to and to which I deem it unnecessary to further refer in this case.

The crank-shaft 47 is mounted, preferably, in a horizontal plane and is held in position by the brackets 48 and 49, one end of said shaft having the crank portion 50, while the opposite end thereof has the controlling-

lever or right-angled extension 51, to the free end of which is pivotally secured the controlling-rod 52, the upper end of which extends loosely through the vertically-disposed slot 53, provided in the bracket 54, which latter is permanently attached to the inner side of the actuating member 20 by means of the rivets 55, as shown in Fig. 2, it being understood that an opening 56 is to be provided in the casing to permit the free upward-and-downward movement of said bracket 54 as it is moved by the operation of the weight 41. The lever-section 51 is held normally upward by means of the spring 57, the lower end of which engages said lever, while the upper end is secured in any preferred way, as by the bolt 58.

The position indicated by Fig. 3 corresponds to the position indicated by Fig. 1—that is to say, the parts are shown in said views as being disposed ready for the reception of a coin, which when placed in position will force the trigger 29 downward and permit the weight 41 to raise the lateral extension 24, which will elevate the bracket 54, and thereby permit the lever-section 51 to be drawn upward by the spring 57, thus disposing the crank-section 50, so that it will fly upward and secure the lower ends 59 of the levers 42, so as to hold the tumbler attached thereto in an extended position, so that it will come in contact with its respective slot formed in the head of the tablet-magazine, which will insure that said magazine will be stopped when the selected tablet has been brought under the diaphragm.

By providing the slot 53 instead of a simple aperture I am enabled to make it possible to push in any of the buttons without accomplishing any result whatever, inasmuch as the crank-section 50 will be held out of contact with the ends 59 of the levers 42, thus making it possible to freely push in any or all of the buttons without accomplishing any other result, as said buttons will be again moved outward when released by the action of the spring 45.

To better illustrate the importance of the slot 53 and the different result obtained than would be the case if a simple aperture were provided in lieu thereof, it will be observed that when the machine is in its operative position and the weight 41 consequently depressed the curved faces of the ends 49 will simply ride over the crank-section 50 and push the same downward sufficiently to enable said end to pass said section, the slot 53 permitting this play or movement of said crank-section without in any wise disturbing the contact between the fingers 34 and 35, which would not be possible if a simple aperture were provided, as in that case any downward movement of the crank-section would so act upon the lever-section 51 that the bracket 54 would be drawn downward, and thereby incidentally depress the lateral extension 24 sufficiently to bring said fingers

out of contact with each other, and thus break the circuit and stop the motor and perhaps leave the phonograph in a half-operated condition.

5 The actuating member 20, it will be observed, may be very cheaply formed of sheet metal or the like, while the weighted section and the bracket 54 are attached in any preferred way, as by the means illustrated, and
10 it will be further observed that the other parts of my coin-controlled mechanism are equally simple in character and may therefore be produced for a very low price, and while my main object has been to follow the
15 guidance of simplicity in my work of producing the various parts, yet I have not in any way sacrificed utility and effectiveness of operation, as said parts will be found amply sufficient to reliably perform the simple duties
20 required of them.

While I have described the preferred construction to be followed in the production of the several parts of my coin-controlled apparatus, it will be understood that I desire to
25 comprehend by this application the substantial equivalent thereof, and I do not, therefore, wish to be confined strictly to the exact showing herein set forth.

Believing that the advantages and construction of my invention have been made fully apparent from the foregoing specification, considered in connection with the accompanying drawings, I will now point out what I claim as new and desire to secure by
35 Letters Patent, viz:

1. In a coin-controlled mechanism, the combination with a conveying-chute, of a pivoted actuating member having a depending portion carrying right-angled extensions, said extensions being adapted to extend into said chute, and a trigger designed to hold said member until released by the falling coin, as specified and for the purpose set forth.

2. In coin-controlled mechanism, the combination of the body-section, a pivotally-mounted coin-directing member, adjusting means entirely separate from said member to limit its movement, and a trigger actuated by the falling coin, all arranged as set forth.

3. In coin-controlled mechanism, the combination of the section provided with a chute, a vertical rib central of the chute, a pivoted actuating member having lateral extensions and a central depending end having means
55 to receive and then release the coin, as set forth.

4. In a coin-controlled mechanism, the combination with a chute or body-section having a double throat, one of which is to receive the false coin, while the other is to receive the true coin, of a pivoted actuating member having a depending portion carrying right-angled extensions, which extend loosely through apertures provided in said chute and reach
65 into and across said throats, whereby the falling true coin will be checked and held in plain view of the operator until said pivoted mem-

ber is restored to the position ready for the reception of the next coin, as specified and for the purpose set forth.

5. In coin-controlled mechanism, the coin-directing counterpoised member 8 having an integral depending extension 11 and vertical opening 13, in combination with an adjustable guiding-finger 14 entirely separate from
75 said member, all arranged as set forth.

6. In a coin-controlled mechanism for phonographs, the herein-described double throat 18 and 19, a pivoted counterpoised member 8 and a guiding-finger 14 so disposed in the
80 path of the falling coin that the latter will be directed into the throat 18; a pivoted member having a depending portion carrying outwardly-extending fingers 26 and 27; a counterpoised extension 41 having a curved outer
85 face adapted to be contacted by an arm of the diaphragm-carriage, and a trigger provided with a hook extension; a counterbalancing-section and a trigger extension proper, said hook being adapted to engage a pin
90 carried by said pivoted member and thereby hold the weight of the end of said member in an elevated position until released by the falling coin, as specified and for the purpose set forth.

7. As an improvement in coin-controlled mechanism for phonographs, vending-machines or the like, a coin-chute having a double throat; a coin-directing pivoted member 8 and a guiding-finger 14 so mounted in said
100 chute that the coin will be directed into the throat designed for its reception and a trigger mechanism so disposed in the path of the falling coin that it will be actuated thereby and incidentally release a pivoted member
105 and thereby close an electric circuit controlling the motor of the phonograph, as specified and for the purpose set forth.

8. The herein-described coin-controlled mechanism for talking-machines consisting
110 of a coin-chute having a double throat in its lower end, a pivoted coin-directing member mounted in the upper end of said chute; a pivoted member 22 having the lateral extensions 23 and 24 and the depending portion 25;
115 outwardly-extending fingers 26 and 27 carried by said depending portion and a bracket 54 provided with a slot 53 and adapted to extend loosely through the wall of the supporting-casing; a series of buttons and levers
120 therefor adapted to cooperate with the carrying-magazine; a crank-shaft in cooperation with said levers at one end, while the opposite end thereof is provided with the lever-section 51, a shaft pivotally connected to said
135 lever-section and loosely fitting in said slot and a spring adapted to hold said extension normally upward, all combined in the manner specified and for the purpose set forth.

9. As an improvement in coin-controlled
130 mechanism, the combination with a chute having a double throat in its lower portion and a pivoted actuating member having fingers 26 and 27 extending into said throats; a

counterpoised trigger having a hook so disposed in the path of the falling coin that said hook will be released from engagement with said pivoted member and permit the same to
 5 move upon its pivot 21; a bracket secured to said pivoted member and extending loosely through an aperture in the casing; said bracket being formed with a slot 53 and a shaft, the upper end of which is adapted to
 10 loosely play in said slot whereby compensation is made for the movement of said shaft without disturbing the position of said bracket or the pivoted member to which it is secured, as specified and for the purpose set
 15 forth.

10. As an improvement in coin-controlled mechanism for phonographs or the like, a chute having a partition wall or rib 5 in its lower portion and a pivoted member 8 disposed in its upper portion; a guiding-finger 14 adapted to cooperate with said pivoted member whereby the coin will be checked until said member is moved downward by the weight of the coin, a pivoted actuating member having a depending portion carrying
 25 downwardly-extending members 26 and 27; slots formed in said chute through which said members may loosely extend, said members being so formed with respect to each other
 30 that they will rest upon either side of a vertical plane, whereby when the trigger is released by the falling coin the member 26 will move into position to hold said coin in plain view of the operator until the trigger has
 35 again been placed by the movement of the diaphragm-carriage in a set position ready

for the next succeeding coin, as specified and for the purpose set forth.

11. As an improvement in coin-controlled mechanism, the herein-described pivoted
 40 member having the weighted end 41 and the extension 24 and further provided with a depending portion 25 having separated right-angled extensions 26 and 27, the former being above the latter, said parts being so dis-
 45 posed that they will alternately rest in the path of a falling coin and temporarily check and then release said coin in its downward movement, as specified and for the purpose set forth.
 50

12. In coin-controlled apparatus, the combination of a pivoted actuating member having an arm provided with a slotted bracket, a crank-shaft 47, a controlling-rod working in said slot and connected to the crank-shaft
 55 and levers carrying buttons controlled by said shaft, all arranged as set forth.

13. In coin-controlled apparatus, a pivoted actuating member provided with a slotted bracket, levers having buttons and means
 60 connecting said bracket and buttons, all operatively combined as set forth.

14. In coin-controlling apparatus, a pivoted actuating member provided with a slotted bracket, as set forth.
 65

In testimony whereof I affix my signature in presence of two witnesses.

GEORGE W. GOMBER.

Witnesses:

I. M. HUNTER,
 GEO. W. RADLER.



No. 659,734.

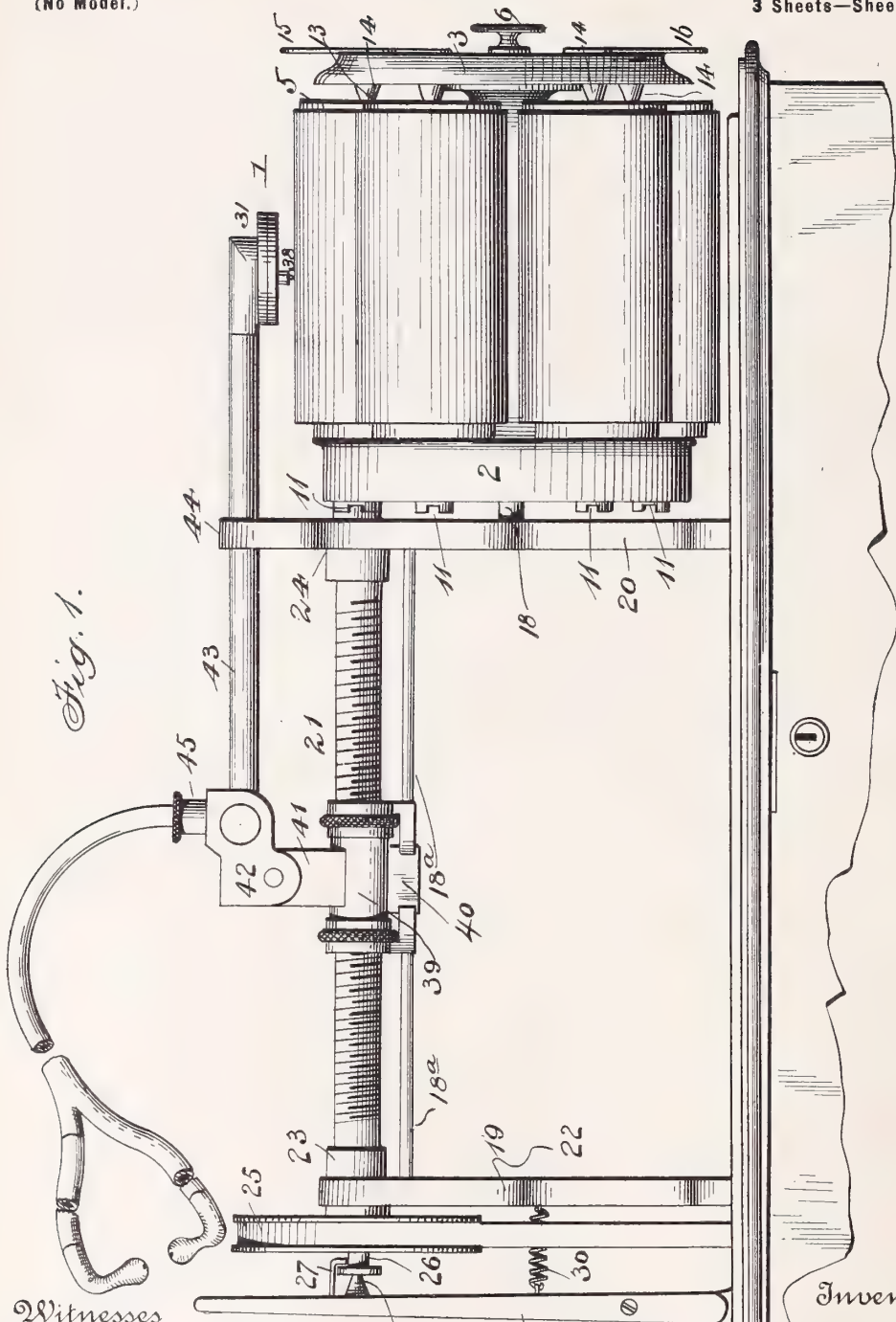
Patented Oct. 16, 1900.

G. W. GOMBER.
PHONOGRAPH.

(Application filed July 13, 1898.)

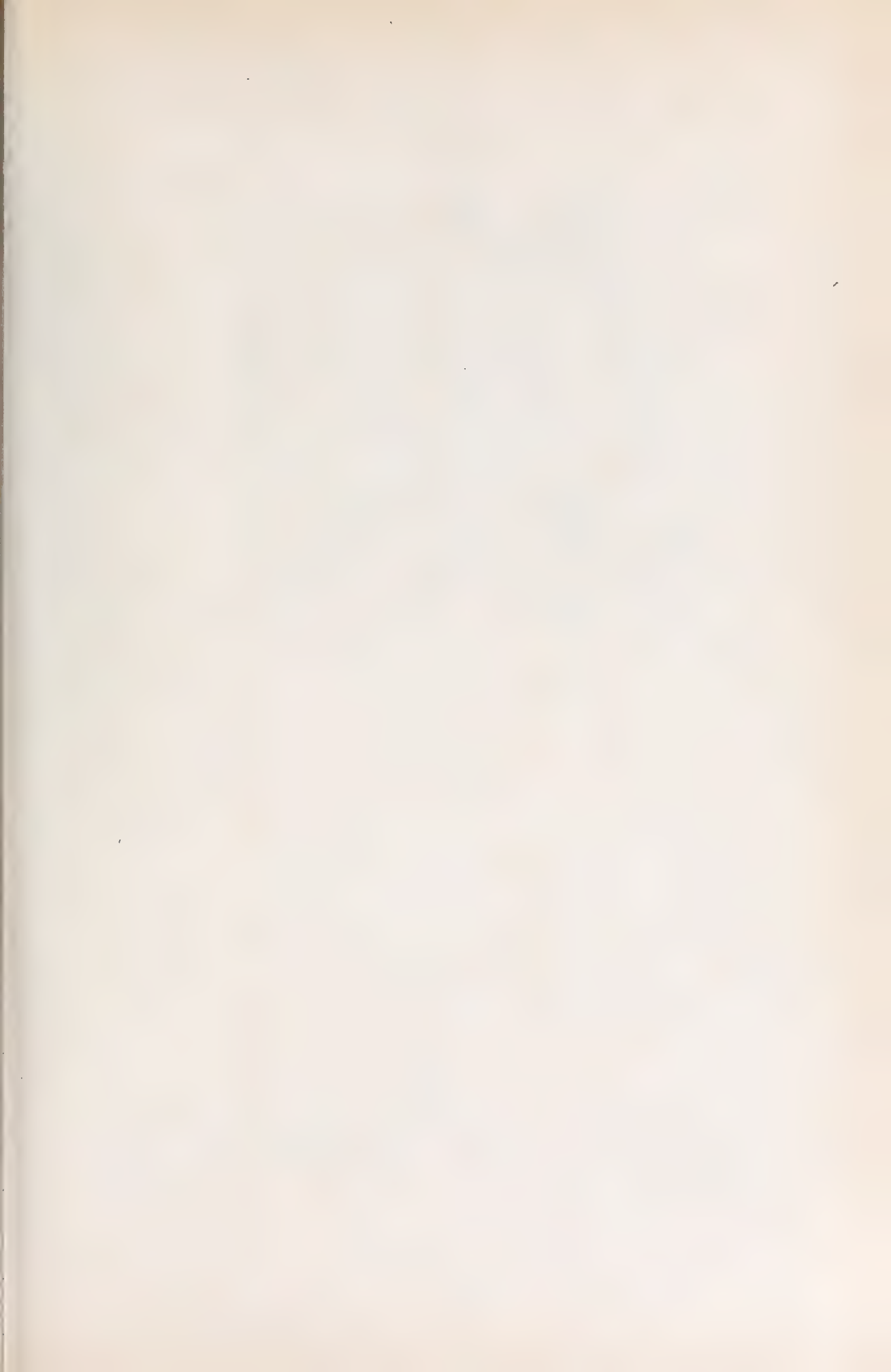
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3 Sheets—Sheet 1.



Witnesses
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No. 659,734.

Patented Oct. 16, 1900.

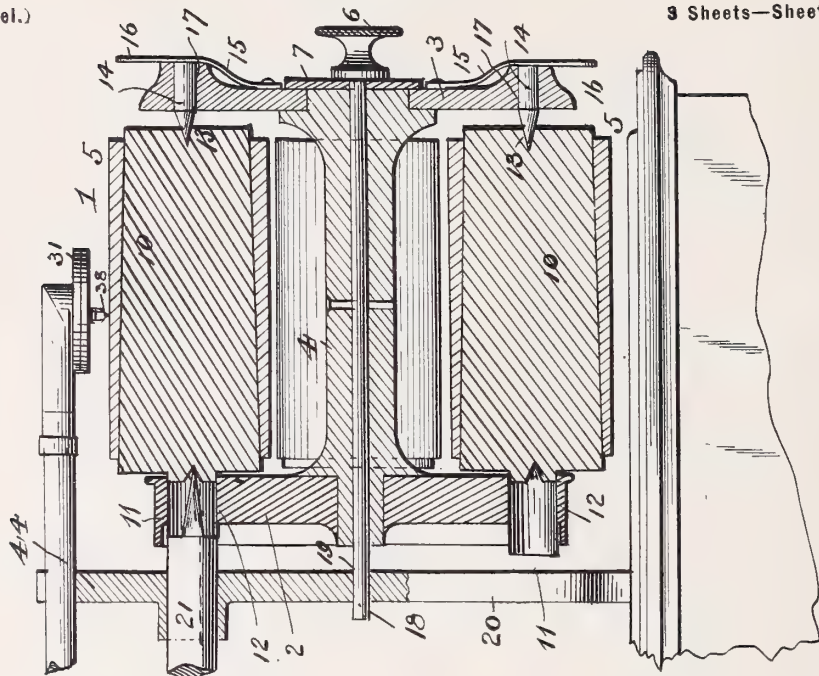
G. W. GOMBER.
PHONOGRAPH.

(Application filed July 13, 1898.)

(No Model.)

3 Sheets—Sheet 2.

Fig. 2.



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No. 659,734.

Patented Oct. 16, 1900.

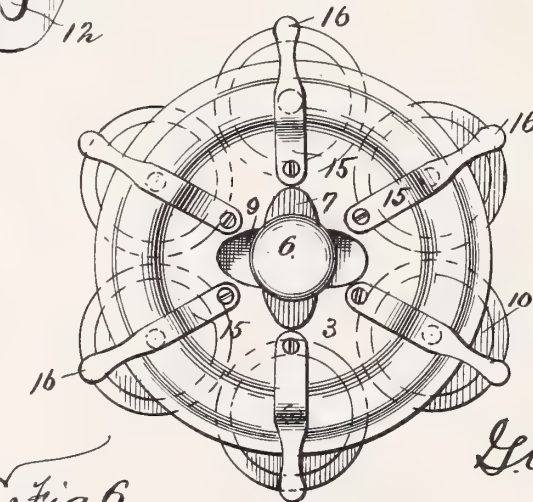
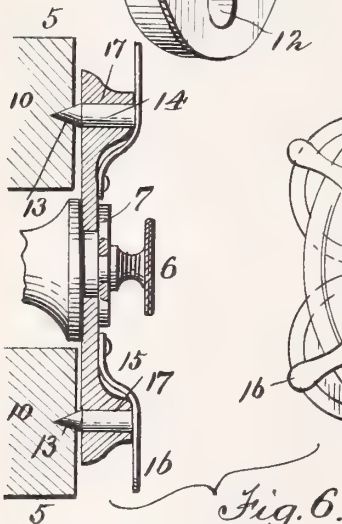
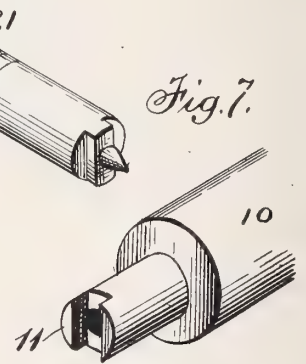
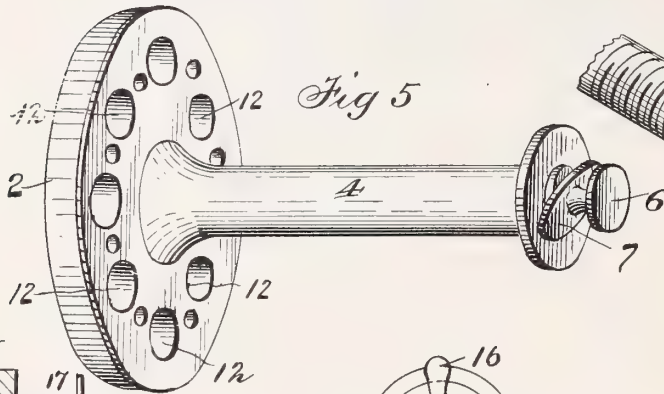
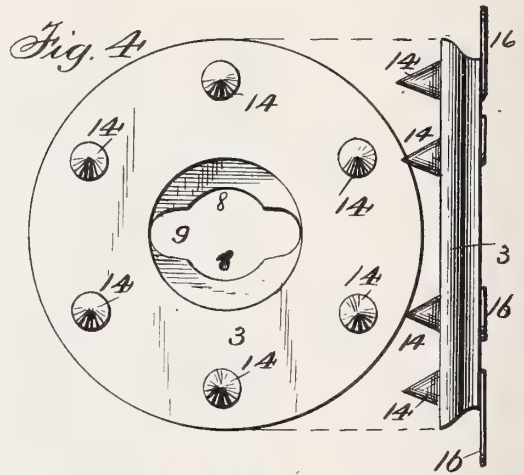
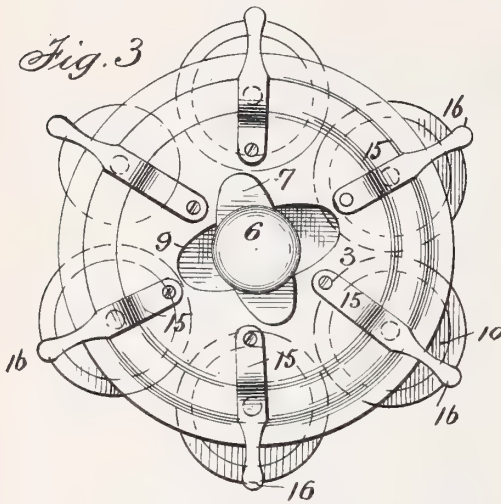
G. W. GOMBER.

PHONOGRAPH.

(Application filed July 13, 1896.)

(No Model.)

3 Sheets—Sheet 3.



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UNITED STATES PATENT OFFICE.

GEORGE W. GOMBER, OF CONYNGHAM, PENNSYLVANIA, ASSIGNOR, BY
MESNE ASSIGNMENTS, TO THE AMERICAN MULTIPLEX TALKING
MACHINE COMPANY, OF WEST VIRGINIA.

PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 659,734, dated October 16, 1900.

Application filed July 13, 1896. Serial No. 599,027. (No model.)

To all whom it may concern:

Be it known that I, GEORGE W. GOMBER, a citizen of the United States, residing at Conyngham, in the county of Luzerne and State of Pennsylvania, have invented certain new and useful Improvements in Talking-Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention has relation to phonographs, and more particularly to the construction of certain parts thereof whereby a series of tablets is provided and placed under the easy control of the operator, enabling the use of one tablet to readily follow its predecessor as the result of partly rotating the magazine, a valuable desideratum when a long speech or continuous line of work is to be followed or when the matter treated is broken into several distinct subjects. It will be apparent, therefore, from the foregoing that the object of my invention is to place at the disposal of the operator a number of tablets, the quantity being determined by the size of the magazine employed, enabling each tablet to be readily placed in or out of their order under the reproducing or transcribing stylus without the loss of time or interruption to the line of thought or a break in the work in hand. All of these features will be clearly set forth in the accompanying specification and drawings.

Referring to the drawings, Figure 1 is a side elevation of the various parts of my invention assembled in their respective operative positions. Fig. 2 is a longitudinal vertical section of Fig. 1. Fig. 3 is an end view of the magazine. Fig. 4 is a view of the edge and the inner face of the retaining head or disk. Fig. 5 is a detail of the securing device for the head of the magazine, showing the shaft to which it is secured with the tablet-mandrel removed and also showing the inner face of the fixed head of the magazine. Fig. 6 is a detail of the individual releasing device for the spindles. Fig. 7 is a detail of a preferred form of clutch for forming con-

nection between the screw-threaded shaft and the tablet-spindles.

Incident to the carrying out of my invention I provide certain preferred details of construction which will be for convenience of description designated by figures, each figure comprehending the same part throughout the several views.

In order to form a group or plurality of tablets, I provide the magazine 1, which is a comprehensive term to designate the disks 2 3 and the central shaft 4, securing the disks together at a proper distance from each other to accommodate the mounting of a plurality of tablet-carrying mandrels 5. Said mandrels are removably mounted in suitable bearings, preferably at equal distance from each other, in the periphery of the disks 2 3.

The disk or head 2 is fixedly secured to the shaft 4, while the disk or head 3 is removably attached to said shaft by means of the set-screw 6 and the clamp 7, said set-screw taking into a central bore provided in the end of said shaft and bringing pressure to bear against the clamp, and thus locking the head 3 into its operative position.

The removable head 3 is provided with the central bore 8, having the lateral enlargements 9, practically providing an elliptical opening in addition to said bore, with which elliptical opening the clamp 7 in size and shape exactly coincides, and it will be understood that when said clamp, which is loosely mounted upon the shaft of the screw 6, is brought into registration with the elliptical opening thus formed the head 3 may be released from the end of the shaft 4 sufficiently to allow the tablet-bearing mandrel to be removed and replaced as desired.

Each of the tablet-bearing spindles consists of the cylindrical body 10, of the usual or any preferred construction, and have upon one end the trunnions 11, adapted to be received by suitable bearings 12, provided in the fixed head or disk 2, while the other end of said mandrel is preferably provided with the central recess 13, adapted to receive the bearing-points 14, carried by the periphery of the removable disk 3. The bearing-points

14 thus provided for each of the tablet-carrying mandrels may be fixedly secured to the periphery of the removable disk 3, though I prefer to so mount them that they may be readily withdrawn from engagement with the central recess in the end of the mandrels by means of the spring-levers 15. Each of these levers consists of a piece of steel or other suitable material and has one end thereof secured to the head 3 near the periphery of its central bore, while the other end of the spring thus provided reaches slightly past the edge of said head and terminates in a suitably-formed handle 16 for manual control. Each of the springs has secured to it the bearing-points 14, which take loosely through apertures 17, provided in the disk, into engagement with the central recess provided in the opposing end of the tablet-carrying mandrel. The tension of said springs is normally disposed so that the bearing-points will be brought firmly into engagement with the mandrels, and by overcoming the tension of the springs said bearing-points may be withdrawn from their engagement, permitting the ready release or replacement of any one of the cylinders and the tablets carried thereby.

The form of construction just described for providing a releasing device for the tablets is desirable when but one of the tablets is to be removed, while the releasing device, as exemplified by the retaining-screw 6 and clamp 7, is preferable when access is desired to a battery of tablets. It will be understood, therefore, that both constructions may be employed at the same time and the independent or simultaneous release of the tablets be effected, as desired.

In assembling the several parts of the magazine just referred to in detail the tablet-carrying mandrels are severally placed in position by entering the trunnions thereof in their respective bearings provided in the fixed head, when the removable head, with its series of bearing-points, is placed in position upon the end of the shaft after first causing the ends of the clamp to register with the openings 9. After the head 3 is thus placed upon the shaft the clamp is placed in a position at right angles to the ellipse formed by the openings 9, when the retaining-screw 6 is turned home upon the clamp, bringing the same to bear tightly against the head and holding it for rotation with the shaft and at the same time forcing the bearing-points 14 into their respective seats in the ends of the cylinders.

The shaft 4 is supported at its inner end in a suitable seat or bearing provided in standard 20, while its outer end is unsupported, and upon said shaft the magazine is adapted to be manually rotated in either direction at the will of the operator, enabling him to bring any preferred tablet into connection with the stylus.

The trunnions 11 are preferably formed so as to extend entirely through the fixed head

2 and terminate in any preferred form of clutch mechanism for engagement with its complement upon the end of the diaphragm-controlling shaft 21. This shaft I mount in a horizontal plane by means of the standards 20 22, provided with suitable bearings 23 24, which will admit of the shaft 21 having a longitudinal reciprocatory movement therein.

The shaft 21 is actuated in any preferred way, though I have shown a pulley 25 upon its outer end. The shaft 21 projects entirely through the pulley 25 and is provided with the peripheral groove 26, adapted to be engaged by the arm 27, attached to the lever 28. Said lever is mounted in an upright position and is provided with the bearing 29, so placed that its end will enter a suitable bore in the end of the shaft.

By the construction above set forth it will be seen that by means of the lever 28 the shaft 21 may be drawn outward from engagement with the ends of the mandrels. The lever 28 is normally held with its contact point 29 against the end of the shaft by means of the spring 30, reaching from the lever to post 22, forcing the shaft 21 into engagement with the end of the mandrel.

It will be understood that any mechanical equivalent may be employed to reciprocate the shaft 21, and I therefore do not wish to be confined to the means I have set forth.

The sound-box 31, with its accompanying stylus, is mounted over the tablet preferably by the means more fully shown in Fig. 1 of the drawings—that is to say, a follower 39, of the usual construction, is mounted upon the threaded shaft 21 and has the depending anchor 40, the lower end of which engages with the guide-rod 18^a, and being loosely mounted thereon rides freely from one end to the other as the follower is actuated positively or reversely, all of which will be clearly understood. Said follower also has erected upon the upper side the post 41, upon which is pivoted the bifurcated end of the holder 42. Said holder has secured thereto the sound-conveying tube 43, of sufficient length to hold the sound-box (to which it is connected) in its operative position over the tablet. Said arm takes loosely through an aperture provided in the upper end 44 of the standard 20, and as the follower is reciprocated by action of the shaft a similar movement will be imparted to the sound-box. It will of course be understood that other means may be employed for actuating the sound-box, and I do not, therefore, wish to be confined to the construction above set forth. The upper part of the holder has secured thereto the terminal thimble 45, of the usual construction, suitable for receiving the usual flexible tube to convey the sound to the ears of the operator, and as the arm 43 is hollow direct connection with the sound-box is effected, thus providing an unobstructed conduit for the sound to travel to the operator.

In operation the follower 39 is drawn to the

extreme outer end of the shaft 21, which may be effected by reverse rotation or by a suitable releasing device attached to the follower (not shown) when the sound-box is simultaneously brought to the inner end of the tablet, causing the stylus to drop into the initial end of the record, when by the application of suitable motive power the shaft will be rotated, causing the follower to travel toward the magazine, thus driving the sound-box over the record synchronously with respect to the formation thereof.

The arm 43 is so constructed as to enable the expeditious removal of the sound-box carrying the transcribing stylus and to permit the replacement thereof by a sound-box carrying a recording-stylus, which of course is practically the usual construction employed, as will be appreciated by those conversant with the art.

Believing that the advantages, the operation, and the construction of my improvements in phonographs will be clearly understood from the foregoing specification, taken in connection with the accompanying drawings, further reference is dispensed with.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a talking-machine, a tablet-magazine having a shaft, a head fixed in relation to the shaft, a removable head and springs carrying spindles passing through the removable head and engaging the ends of the tablets, all combined as set forth.

2. In a talking-machine, a tablet-magazine

having mandrels and a removable head, springs carrying pointed spindles passing through said head and engaging an end of each mandrel, all combined as set forth. 40

3. In a talking-machine, a tablet-magazine having a removable head carrying spring-controlled spindles, as set forth.

4. In a talking-machine provided with a removable and a non-removable head, mandrels having one end terminating in trunnions seated in the non-removable head, the removable head carrying spring-controlled spindles engaging the other end of the mandrel, all combined as set forth. 45 50

5. In a talking-machine, a tablet-magazine provided with a non-removable and a removable head, the latter carrying independent spring-controlled spindles engaging one end of a mandrel whereby any individual mandrel may be removed without disturbing the other mandrels, all combined as set forth. 55

6. In a talking-machine, a tablet-magazine provided with a shaft and having a non-removable and a removable head having an oblong aperture therein and carrying spring-controlled spindles, and a rod extending through the shaft and having a retaining-nut corresponding in form to the aperture, whereby a quarter-turn will lock said head in position, all combined as set forth. 60 65

In testimony whereof I affix my signature in presence of two witnesses.

GEORGE W. GOMBER.

Witnesses:

HARRY F. GOMBER,
J. B. BOHLANDER.



No. 659,735.

Patented Oct. 16, 1900.

G. W. GOMBER.
PHONOGRAPH.

(Application filed Aug. 18, 1896.)

(No Model.)

3 Sheets—Sheet 1.

A Fig. 1.

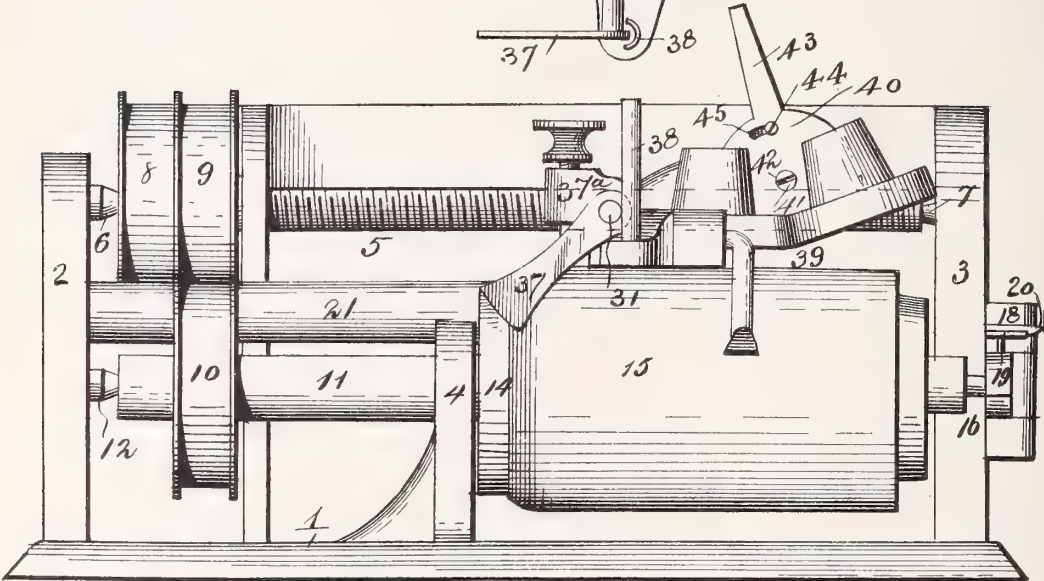
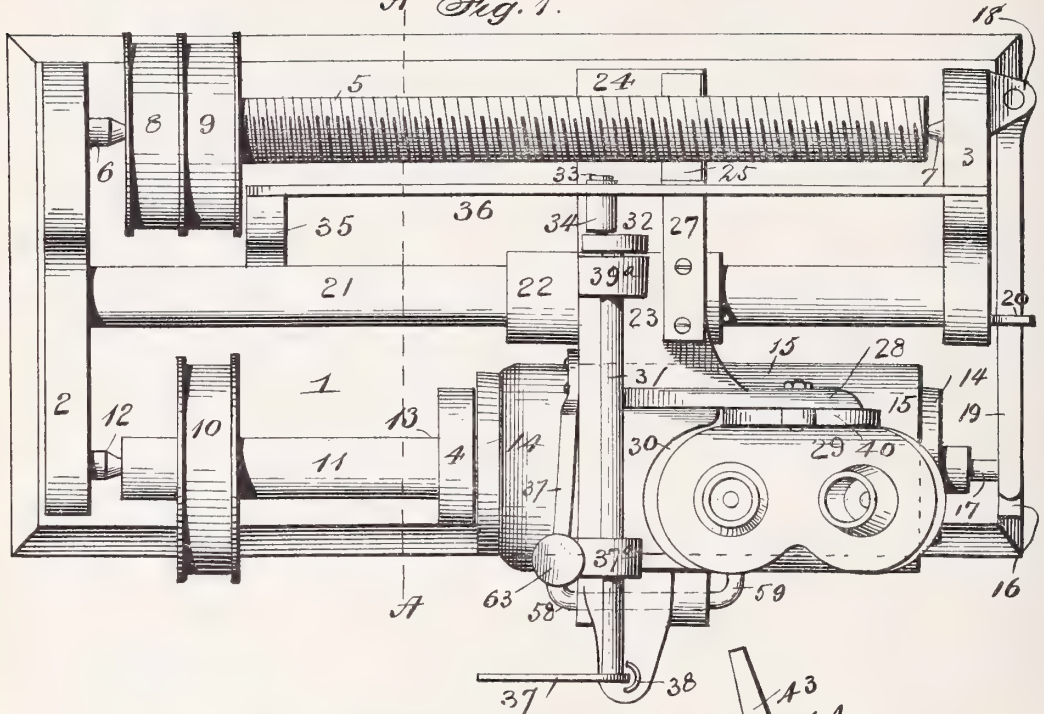


Fig. 2.

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G. W. GOMBER.
PHONOGRAPH.

(Application filed Aug. 18, 1896.)

(No Model.)

3 Sheets—Sheet 2.

Fig. 3.

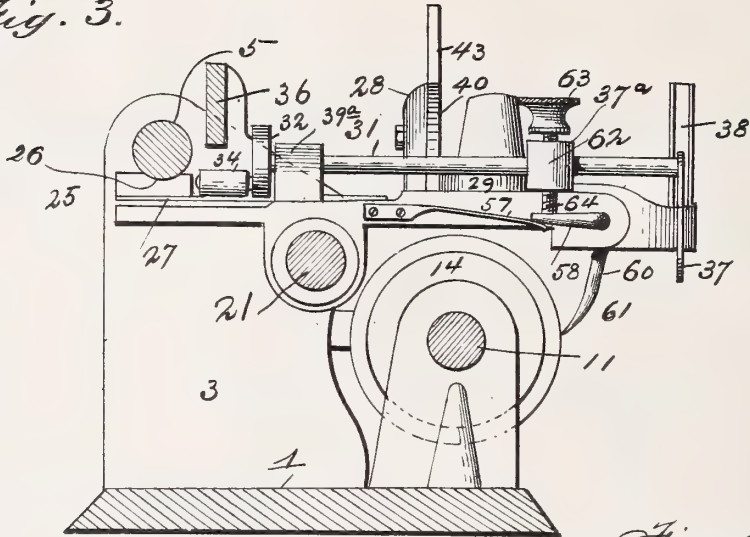


Fig. 4.

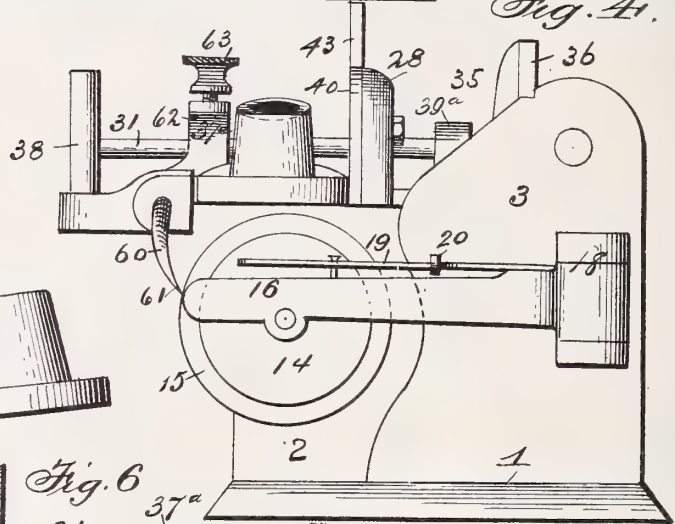


Fig. 5.

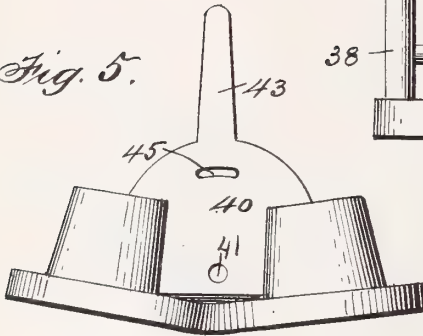


Fig. 6.

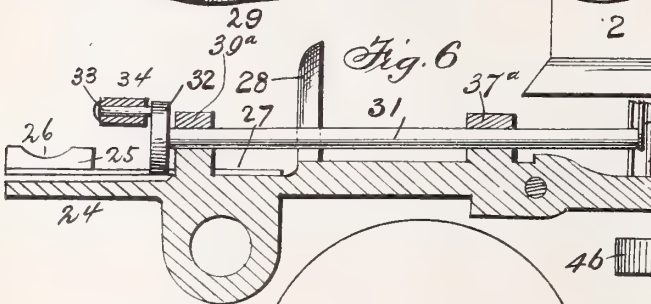


Fig. 8.

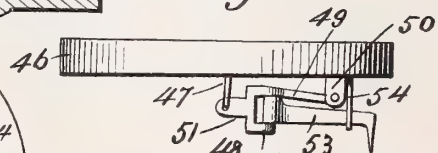
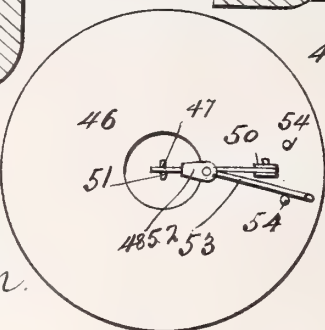
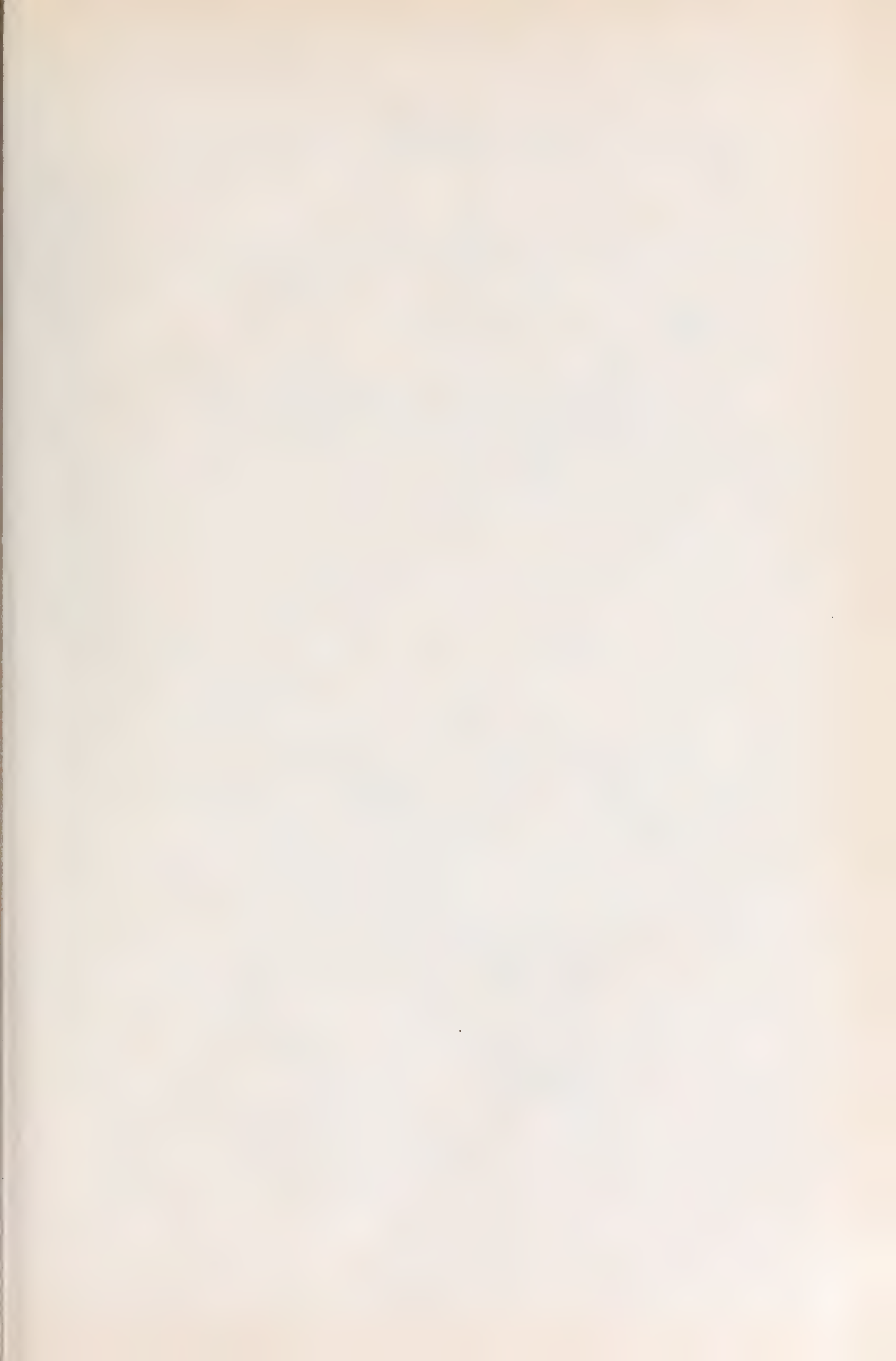


Fig. 7.

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No. 659,735.

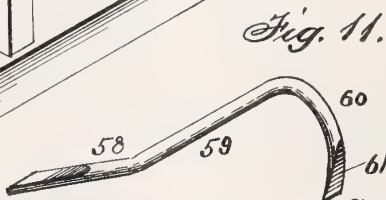
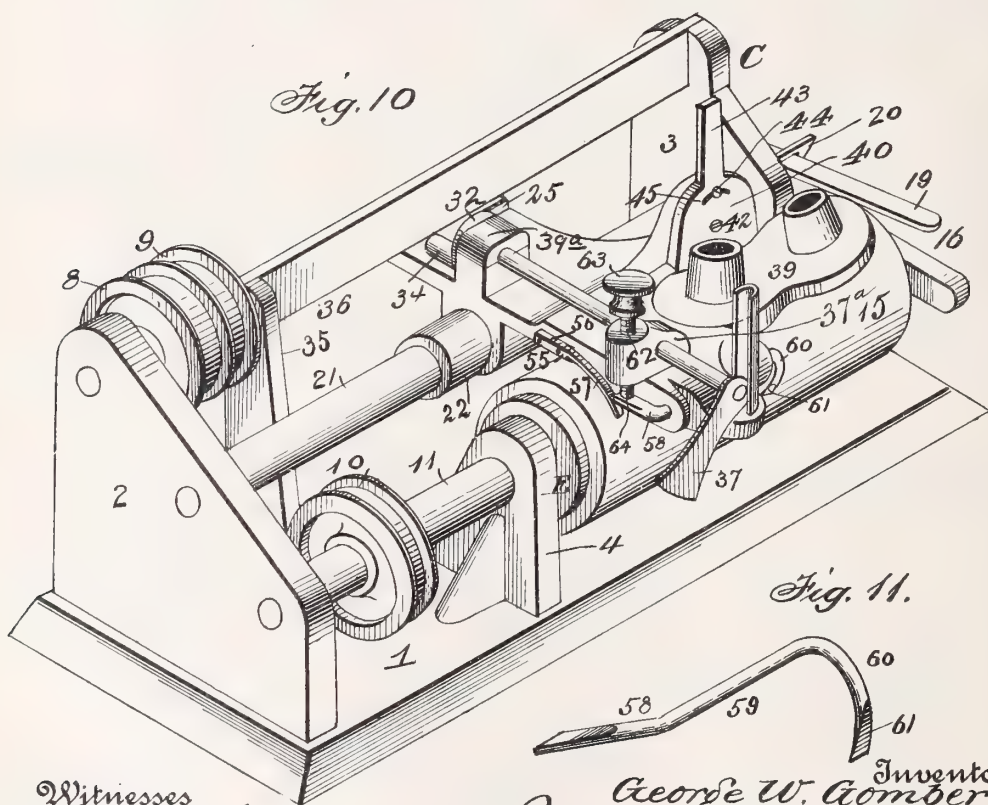
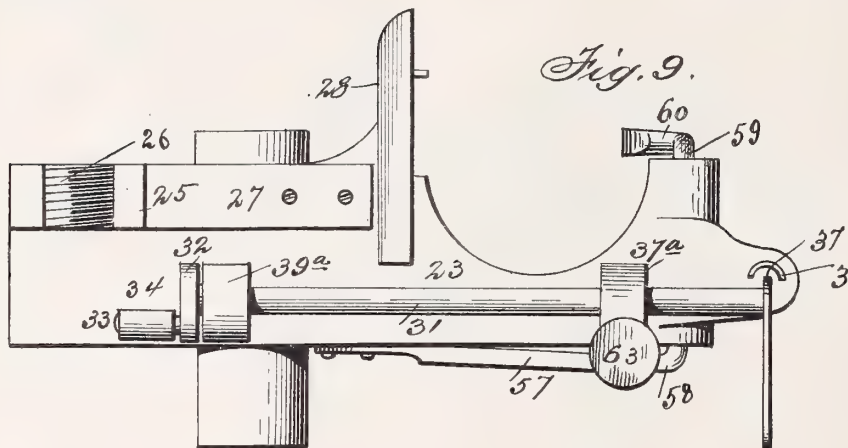
Patented Oct. 16, 1900.

G. W. GOMBER.
PHONOGRAPH.

(Application filed Aug. 18, 1896.)

(No Model.)

3 Sheets—Sheet 3.



Witnesses
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UNITED STATES PATENT OFFICE.

GEORGE W. GOMBER, OF CONYNGHAM, PENNSYLVANIA, ASSIGNOR, BY
MESNE ASSIGNMENTS, TO THE AMERICAN MULTIPLEX TALKING
MACHINE COMPANY, OF WEST VIRGINIA.

PHONOGRAPH.

SPECIFICATION forming part of **Letters Patent No. 659,735**, dated **October 16, 1900**.

Application filed August 18, 1896. Serial No. 603,128. (No model.)

To all whom it may concern:

Be it known that I, GEORGE W. GOMBER, a citizen of the United States, residing at Conyngham, in the county of Luzerne and State of Pennsylvania, have invented certain new and useful Improvements in Talking - Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

One object of my invention is to render a talking-machine easily operative and completely under the control of the person using it, and relates to certain details involved in the construction of various parts, as will be more particularly pointed out in the appended claims.

A further result which I aim to produce is involved in the construction and combination of the parts necessary to provide a reproducing-stylus that will readily follow the line of record.

A further object is to provide a paring-knife for placing a perfectly-finished surface upon the tablet or for restoring such surface after the tablet has been filled with a record.

In developing my invention I aim at simplicity of construction of the details involved and provide that such details will be fully under the control of the operator, while my improved paring device for preparing the surface of the tablet for further use may be attached to or mounted upon the phonograph-carriage as now usually constructed, though it is especially applicable to the form of carriage which I have herein described.

The advantages above set forth are attained by means of the special construction and adaptation of parts and their substantial equivalents referred to in the following specification and illustrated by the accompanying drawings, and in conformity with this plan—

Figure 1 is a top plan view. Fig. 2 is a front elevation showing one sound-box disposed in cooperation with the tablet. Fig. 3 is a section of Fig. 1 on line A A. Fig. 4 is an end view showing means for locking the tablet in position and releasing the same.

Fig. 5 is a detail of the duplex holder or combined recorder and reproducer. Fig. 6 is a longitudinal section of carriage-elevating mechanism. Fig. 7 is a plan view of the lower side of the sound-box, showing the stylus-carrying arm swung to one side. Fig. 8 is an edge view of Fig. 7. Fig. 9 is a top plan view of the carriage. Fig. 10 is a perspective view of the talking-machine, and Fig. 11 is an enlarged detail of the knife and its accompanying shaft.

In developing my invention and for convenience in describing the details involved I will refer to and show such parts of the usually-constructed phonograph as may be necessary in order to establish the relative positions occupied by my improvements, and in conformity to this plan the various parts will be designated by figures.

Upon the base 1 I erect the end sections 2 3 and standard 4, the same constituting the general framework for supporting the other parts.

5 represents a threaded shaft formed in the usual manner and mounted in conical end bearings 6 7, seated, respectively, on the standards 2 3. Upon the end of said shaft I mount, near the bearings 6, the pulleys 8 9, the former adapted to receive power and the latter adapted to communicate it to pulley 10, mounted on the shaft 11. Said shaft 11 is provided with a central bearing-point 12, carried by the end section 2, and is further supported by a suitable bearing 13, provided in the upper end of standard 4.

By mounting the shaft 11 in the manner above described the free end thereof, or that part projecting through the standard 4, is adapted to support and carry the tablet-cylinder 14 in such a manner as to permit the tablet 15 being removed or replaced and locked in position when the pivoted holder 16, carrying the center point 17, is swung into its operative position, causing said center point to enter the seat provided in the end of the shaft. The holder 16 is provided with a suitable hinge or bearing 18, attached to the end section 3, enabling it to be swung outward for releasing the tablet-cylinder, and

it is locked in its normal position by the longitudinally-disposed spring 19, engaging with its keeper 20. Disposed intermediate of the shafts 5 and 11 is the stationary shaft 21, rigidly secured in apertures provided in the end sections 2 3. This shaft is cylindrical in form and provided with a smooth surface, enabling the barrel 22 to slide loosely thereon. Said barrel has a smooth bore of proper diameter to receive said shaft and is firmly attached to the under side of the carriage 23, or it may be formed integral therewith, if desired.

The carriage 23 is in general outline an oblong and extends sufficiently rearward to reach under and slightly past the threaded shaft 5, and also extends forwardly, reaching over and past the tablet. Upon the rear end 24 of the carriage is mounted the guide-block 25, formed of suitable material and provided with the concave threaded face 26, designed to engage the periphery of the threaded shaft 5, whereby when the shaft 5 is rotated the carriage is moved in either direction. Said guide-block is disposed and normally held slightly above the surface of the carriage by means of the supporting-spring 27, secured to the carriage at any desired point. At a point nearly over the cylinder-tablet I erect on the carriage the laterally-reaching arm 28, adapted to carry the duplex diaphragm-holder or double sound-box 29, which is pivoted thereto in such a manner as to have a rocking movement, as will be hereinafter referred to. The edge of the carriage opposing the end section 3 is provided near its outer end with a semicircular opening 30 to enable one end of the duplex holder to rest therein, and thus enable the recorder or reproducer to be brought with its stylus in contact with the tablet without the necessity of providing an undesirable length for said arm 28. In order to elevate the outer end of the carriage, I provide the controlling-shaft 31, which is disposed parallel to the carriage and passes through apertures provided in the shoulder 37^a, and a bearing-seat 39^a, the latter being erected upon the opposite end of the carriage nearly over the barrel 22. Upon the inner end of the shaft 31 thus provided I secure the disk 32 by means of a suitably-formed central mortise or aperture. Said disk is changed into an eccentric by mounting upon its inner face near its outer edge the finger 33, and upon such finger I loosely mount the sleeve 34, which is designed as an antifriction device.

By means of the standard 35, erected upon the base 1, I support the bar 36, one end being supported by said standard, while the other end reaches in a horizontal plane to the end section 3, in which it is properly secured. The lower edge of said bar contacts with the sleeve 34 and being properly adjusted will cause said sleeve to bear against it, thereby depressing the inner end of the carriage when the shaft 31 is properly rotated. The outer end of said shaft is provided with an operat-

ing handle or lever 37, which is so mounted upon the shaft with respect to the location of the finger 33 that it will cause said finger to slightly pass the dead-center when said handle 37 is inclined against the supporting-standard 38.

The guide-block 25 may be held slightly above the surface of the carriage by the spring 27, thereby causing it to yieldingly receive the contact of the threaded shaft, and thus obviate any unnecessary blows. By elevating the handle 37 the carriage will be disconnected from its source of power, when it may be freely moved upon the shaft 21, thereby enabling the recorder or reproducer to be moved to any desired point on the surface of the tablet and the ready interchange of position of the recording and reproducing stylus, as may be desired.

The holder 29, which I will term a "spectacle-frame," is so formed as to provide a means for carrying both a recording and reproducing stylus and their respective sound-boxes, joined together, substantially as shown, in such a manner that they will occupy a different plane with respect to each other. To the rear side of the two sound-boxes thus joined together I attach at a central point the upwardly-inclined lip 40, provided with a centrally-disposed aperture 41, by means of which said lip is pivotally connected to the arm 28 by the bolt 42. By thus mounting the duplex holder it will have a vibrating or oscillating movement, thereby enabling the recording and reproducing stylus to be alternately brought into coöperation with the tablet.

For convenience of manipulating the duplex holder I erect upon the upper edge of the lip 40 the lever 43, and to check further movement of the holder when the recorder or reproducer is in its proper operative position I provide the stop 44 and the slotted aperture 45, formed in said lip. When either stylus is brought into coöperation with the tablet, the stop 44 will check further movement, and the device may thus be held in an adjusted position by a suitably-provided spring (not shown) or other preferred means.

The sound-box 46 is constructed in the usual or any preferred manner and has dependent therefrom the usual form of link 47, pivotally connected to the stylus-holder 48. This holder is of a peculiar construction and consists of the main section or body 49, reaching toward the edge of the sound-box, where it is pivotally seated in the bifurcated standard 50, erected upon the under side of the sound-box near its outer edge. The stylus-holder 48 also has the vertically-disposed extension 51, which terminates in the lip 52, disposed at right angles to said extension and parallel with the body 49. By this formation I provide a seat in which I pivot the inner end of the stylus-carrying arm 53, as is clearly seen in Fig. 8. In order to circumscribe the lateral swing of said arm, I erect at proper distances on either side of the plane occupied

by the holder 48 the posts 54. (More clearly shown in Fig. 7.) In practice it will be found that only a limited lateral departure is made by the line of record, yet the construction above set forth will enable such line of record to be reliably followed at all times.

In developing my improved paring device I attach to the left-hand edge or outer end of the carriage-body a spring 55, provided with a body-section 56 and a flexible spring-section 57, and I so dispose said spring that its free end will rest under the end of the lever 58, which passes through the end of the carriage and is seated in suitable bearings therein. To the other or right-hand end of the shaft is attached the shank 60, on the end of which is provided a knife or blade proper, 61. In order to control the position of the cutting edge of the knife, I mount in a suitable bearing or seat 62 the set-screw 63, so disposed in a vertical plane in said bearing that its free or lower end 64 will bear upon the upper side of the lever 58 and overcome the tension of the spring 57. The spring 57 normally holds said lever in an elevated position. By causing the set-screw to pass downward into its seat or bearing the lever will be depressed, resulting in a recession from the tablet of the cutting edge of the knife, while the elevation of said set-screw will permit the lever to rise by the action of the spring 57, causing the knife to take into the surface of the tablet to any desired extent.

In practice it is found desirable that means be provided for preparing a tablet for additional service after the same has been once filled with a record. This I have accomplished in a manner which will prevent a special operation for that purpose, as the rotation of the tablet necessary to transcribe a record thereon may be utilized for removing said record immediately after the transcriber has passed over it, inasmuch as the paring device may be placed immediately in advance of the recording-stylus, so as to remove a prior record placed thereon.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a carriage-controlling device for phonographs, the combination with the carriage, of a shaft mounted thereon and provided with an operating-handle; an eccentrically-disposed arm secured to the end of said shaft and adapted to bear against a part

of the frame of the machine, thereby causing the inner end of the carriage to be forced out of contact with the source of power and locked in such position when said handle moves said arm past the dead-center, as and for the purpose set forth.

2. As an improvement in talking-machines, the herein-described carriage comprising a barrel 22 adapted to loosely receive the shaft 21 and the carriage-body secured to said barrel and extending rearwardly and forwardly therefrom and having on its interior extension the laterally-reaching arm 28 and the semicircular opening 30, and means for detachably connecting said carriage with the threaded driving-shaft, in combination with said threaded shaft and with a rocking shaft having an eccentric head mounted on said carriage and provided with an operating-lever adapted for simultaneously elevating the forward end and depressing the rear end of the carriage, as and for the purpose set forth.

3. As an improvement in talking-machines, the combination with a sound-box, of a stylus-carrying arm or holder 48 having the vertical extension 57 and the lip 52, and further having the stylus-carrying lever 53 pivoted on said lip, and means to limit the lateral movement of said lever, substantially as specified and for the purpose set forth.

4. As an improvement in talking-machines, the combination with a sound-box, of a link, a support pivoted at one end to said link and at the other to a suitable standard provided on the sound-box, said holder having the pivotal seat provided by the lip 52; a stylus-carrying arm pivoted on said lip, and suitable means for limiting the lateral movement of said arm, substantially as specified.

5. In a paring device for talking-machine tablets, the combination with the diaphragm-carriage, of a rock-shaft mounted thereon and provided with a knife and a lever; a set-screw bearing upon said lever and thereby adapted to throw the knife out of contact with the surface of the tablet, and means substantially as described for normally holding said lever in an elevated position, as and for the purpose set forth.

In testimony whereof I affix my signature in presence of two witnesses.

GEORGE W. GOMBER.

Witnesses:

HARRY F. GOMBER,
JAMES MENIG.

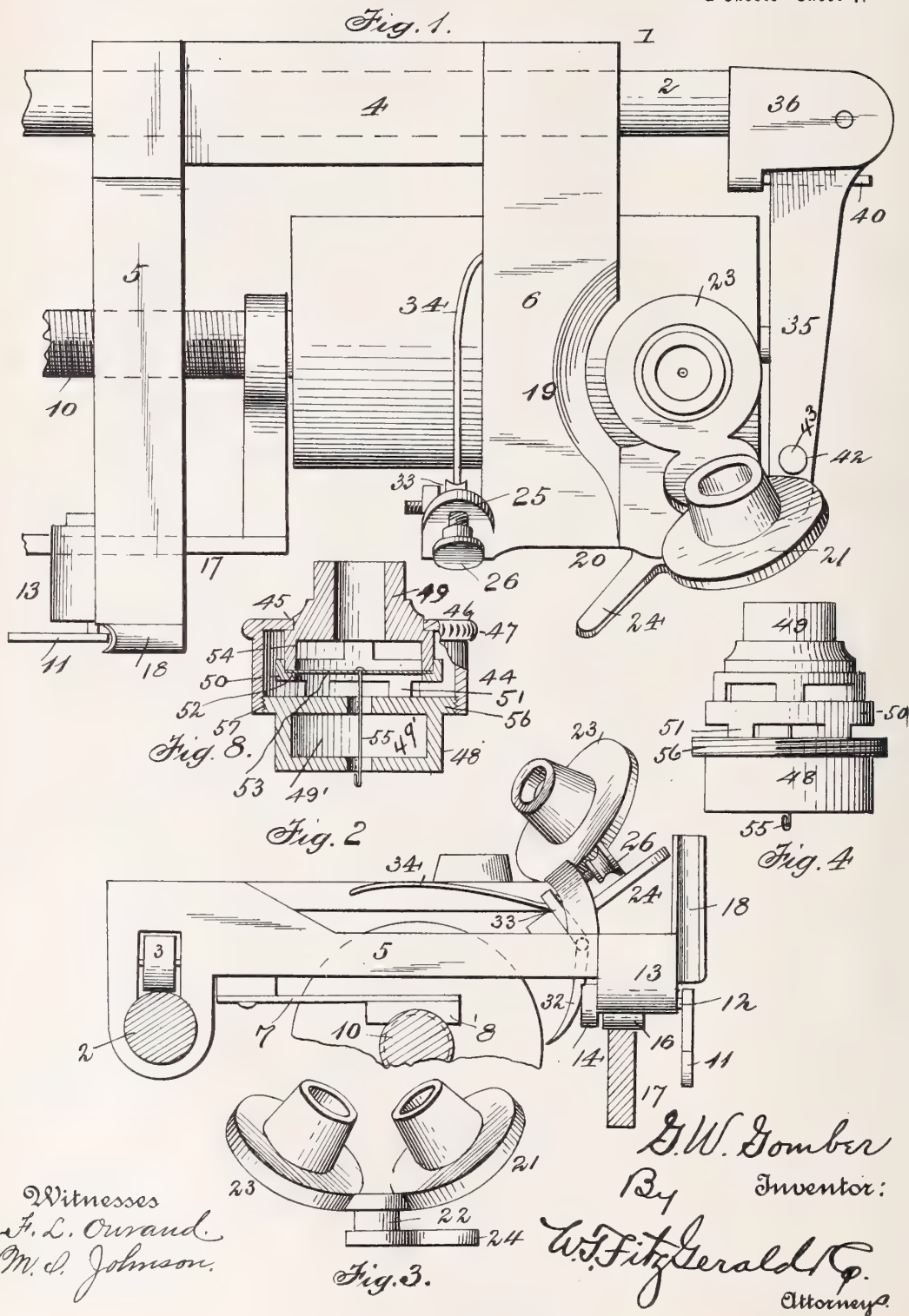


G. W. GOMBER.
TALKING MACHINE.

(Application filed Sept. 5, 1896.)

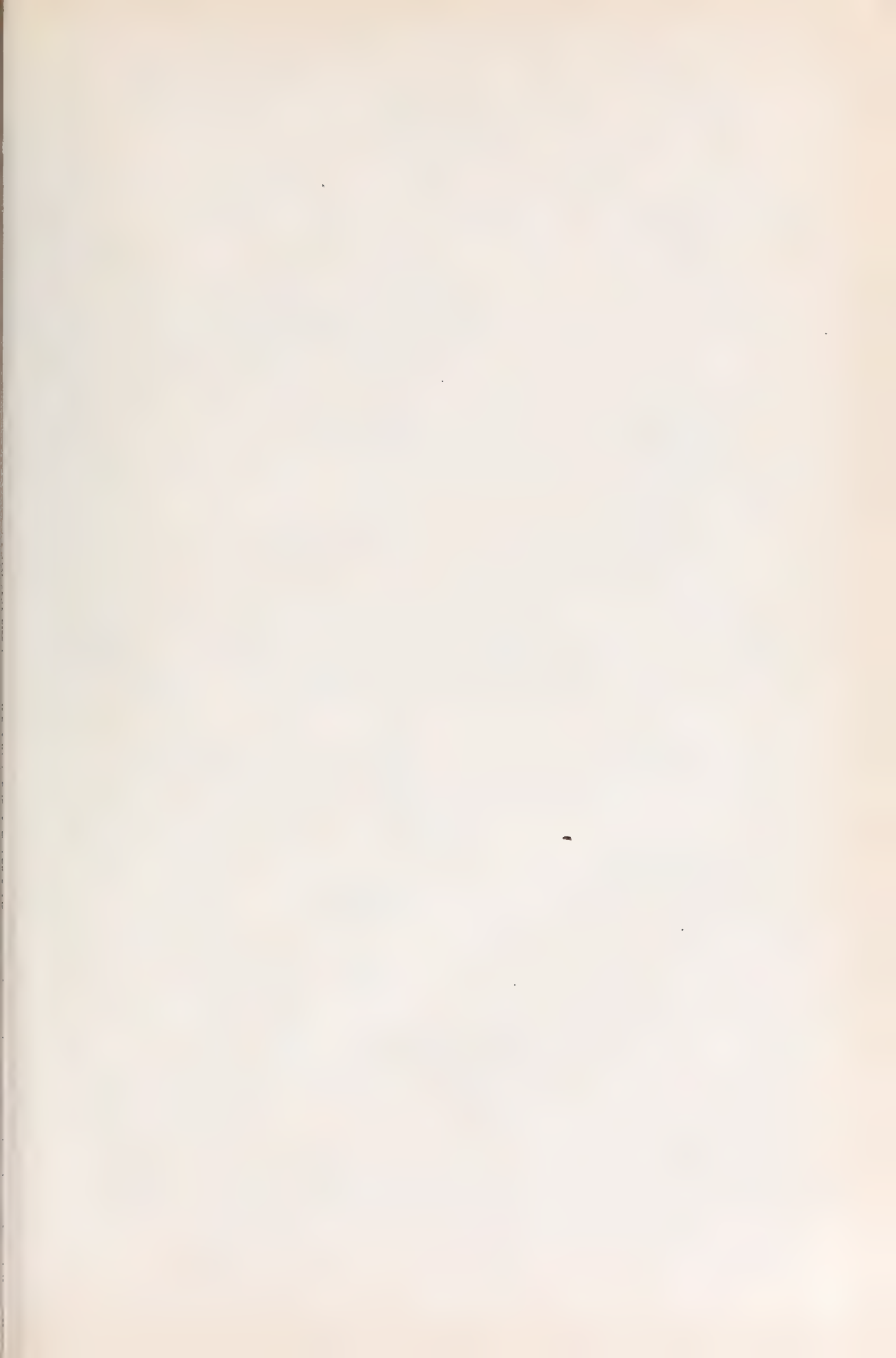
(No Model.)

2 Sheets—Sheet 1.



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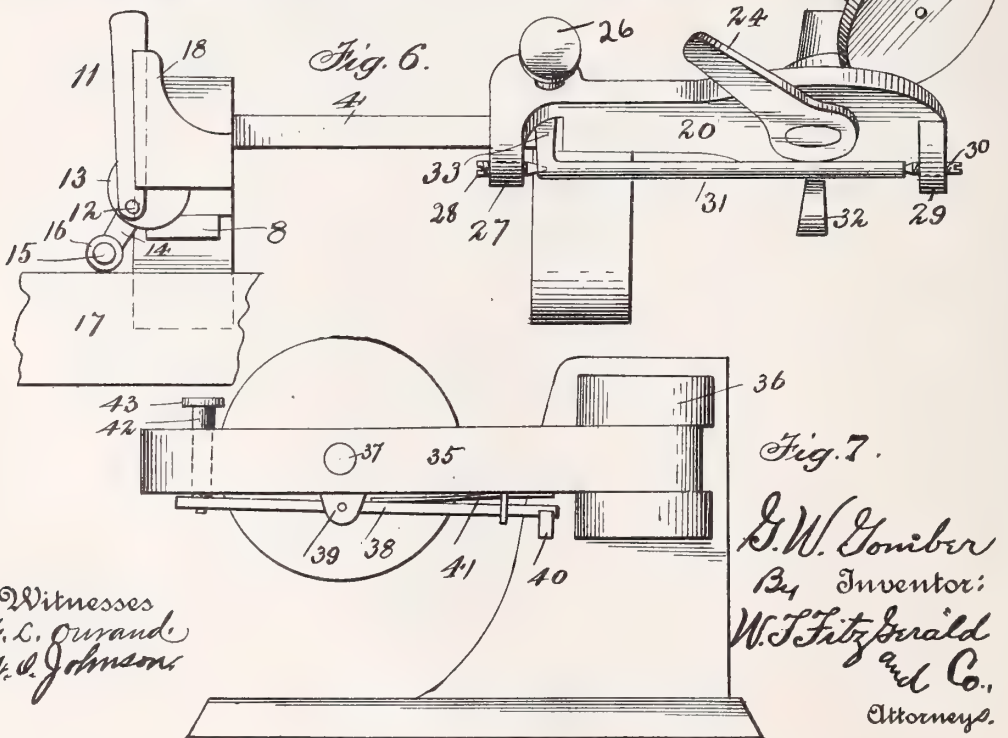
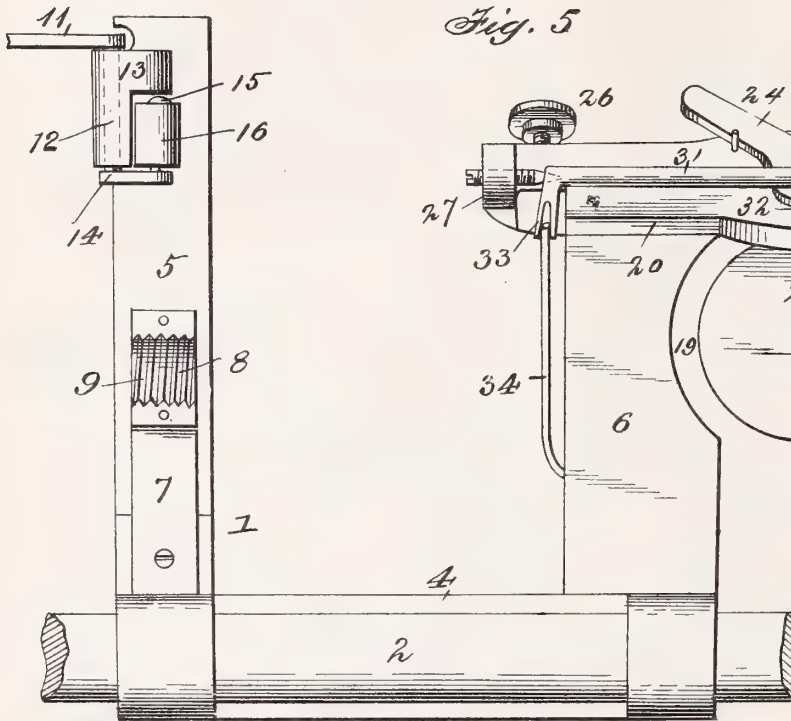


**G. W. GOMBER.
TALKING MACHINE.**

(Application filed Sept. 5, 1896.)

(No Model.)

2 Sheets—Sheet 2.



UNITED STATES PATENT OFFICE.

GEORGE W. GOMBER, OF CONYNGHAM, PENNSYLVANIA, ASSIGNOR, BY
MESNE ASSIGNMENTS, TO THE AMERICAN MULTIPLEX TALKING
MACHINE COMPANY, OF WEST VIRGINIA.

TALKING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 659,736, dated October 16, 1900.

Application filed September 5, 1896. Serial No. 604,968. (No model.)

To all whom it may concern:

Be it known that I, GEORGE W. GOMBER, a citizen of the United States, residing at Conyngham, in the county of Luzerne and State of Pennsylvania, have invented certain new and useful Improvements in Talking-Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The object of the invention hereinafter described and claimed is to supplement certain details of construction fully set forth and claimed in my application for Letters Patent for improvements in talking-machines, filed August 18, 1896, Serial No. 603,128.

My invention also comprehends certain improvements in the formation of the diaphragm.

My invention relates to the improvement of certain details involved in the production of a completely-operative talking-machine, and relates more particularly to the formation of the carriage, to a paring apparatus mounted upon said carriage, and to a duplex diaphragm-holder, and, further, to means for providing a bearing-point and a holder therefor which will enable it to hold such bearing-point into engagement with the outer end of the tablet-cylinder, and means for locking such holder in its operative position.

It will be seen that the construction herein described, and illustrated by the accompanying drawings, is, aside from the diaphragm, practically a varied form from that set forth in my application above noted, and while in some particulars the variation may appear to be slight yet I have discovered by practice and demonstration that such changes are material and valuable, rendering the machine more complete and tractable.

The frame proper of the phonograph, it will be seen, is formed, substantially, in the usual manner and provides bearing-seats for the cylinder-carrying shaft and also for the fixed shaft, upon which the carriage rides.

Various details of my invention will be referred to in the accompanying drawings,

which are made a part of this application, and in which—

Figure 1 is a top plan view of the carriage and some of the contiguous parts of the talking-machine, showing the relative arrangement of such parts with respect to the carriage. Fig. 2 is a side elevation of the carriage. Fig. 3 is a detail in elevation of the duplex diaphragm-holder. Fig. 4 is a side elevation of the diaphragm. Fig. 5 is a bottom plan of the carriage. Fig. 6 is a front elevation thereof, while Fig. 7 is an end view showing the bearing-carrying gate. Fig. 8 is a vertical section of the diaphragm.

It will be seen from the foregoing figures that the illustration of my invention is confined to the carriage and the parts mounted thereon, as I deem it unnecessary to illustrate the complete talking-machine.

Only such parts of the machine are shown as are necessary to determine the relationship between the same and the carriage.

For convenience of referring to the details of construction each part will be designated by the same figure of reference throughout the several views.

In order to enable the carriage 1 to be freely and easily reciprocated upon the shaft 2, I provide the roller-bearings 3, which are suitably mounted in the end of the carriage, as shown, and are adapted to contact with the upper periphery of said shaft, thus reducing the strain or friction due to the movement of the carriage to the minimum.

It will be seen that the carriage proper consists of the end section or body 4 and the side sections 5 6. The object in thus providing the two separate side sections is to obviate the necessity of forming the carriage of one piece of material, resulting in lightness of weight for the carriage and also leaving the open section between the side pieces 5 6, permitting at all times a free inspection of the tablet or other parts under the carriage.

Upon the under side of the side section 5 of the carriage and at a point near the shaft 2 I secure the spring 7 in such a manner that its free end will be held slightly out of conflict with said section, as will be clearly seen

in Fig. 2 of the drawings. To the free end of the spring thus mounted I attach the bearing-block 8, having the threaded concave face 9, adapted for contact with the threaded shaft 10. By thus mounting the bearing-block upon the end of the spring a yielding contact will be provided for said shaft when the carriage is dropped into its operative place, thus taking up all jar or blows following a careless manipulation of the carriage.

In order to readily though slightly raise the carriage and its accompanying bearing-block out of contact with the threaded shaft 10, I provide the lever 11. Said lever 11 is rigidly connected at its lower end to the shaft 12, which passes through the bearing-seat 13, connected to the outer end of the section 5. The shaft 12 therefore is disposed parallel with said section and reaches through the bearing-seat 13 and is rigidly connected to the crank-arm 14, which in turn carries the outwardly-reaching axle 15, upon which is mounted the friction-roller 16, as more fully shown in Fig. 5 of the drawings. By this construction it will be seen that the friction-roller thus provided reaches downward into contact with the track 17, forming part of the framework of the machine, and is adapted to ride upon said track when the carriage is reciprocated upon its shaft.

The crank-arm 14 is so mounted upon the shaft 12 with respect to the operating-lever 11 that when said lever is resting in a vertical plane against the stop or support 18 said crank-arm will rest in an inclined position, its lower end reaching outward from the plane of the lever, and thus causing the weight of the carriage to hold said lever firmly against the stop provided therefor. It will be seen by this construction, more particularly illustrated in Fig. 6 of the drawings, that when the upper end of the lever is drawn away from its stop it will cause the friction-roller to travel inward toward the carriage until the plane occupied by the lever when in a vertical position is passed, when the weight of the carriage and the lever will both operate to cause said friction-roller to travel still farther inward and by such means lower the outer end of the carriage sufficiently to bring the bearing-block into contact with its threaded shaft.

By the construction above set forth it will be seen that the outer end of the carriage is provided with an antifriction device both when said carriage is in an elevated and depressed condition—a valuable consideration, reducing, as it does, to a minimum the power required to reciprocate the carriage.

The side section 6 of the carriage is adapted to carry a paring mechanism for the tablet and also provides a seat, upon which I pivotally mount my duplex diaphragm-holder. The outer edge of the section 6 is cut away, forming the concavity 19, the office of which is to enable the diaphragm-holder to be more closely adjusted or mounted to said section.

At the outer edge and preferably at the extreme end of said section 6 I erect the arm 20, which, it will be understood, may be formed integrally with said section or may be secured thereto in any preferred way. It will be seen that said arm is disposed radially with respect to the tablet-cylinder, the object of such disposition being to enable me to mount the diaphragm-holder 21 so that the same may be reciprocated upon the journal 22 when the latter is properly seated in bearings provided in the arm 20.

The diaphragm-holder 21 may be formed in any preferred manner and consists of the frame-section 23, adapted to encompass the diaphragm proper and securely hold the same therein. Said frame is so formed that the diaphragms carried thereby are disposed in an entirely different plane with respect to each other, the degree of inclination for which being determined by the requirements in each case, the object being to enable first one and then the other diaphragm to be brought into operative contact with the tablet when the journal 22 is rotated in its bearing by means of the lever 24. By this construction and by the peculiar arrangement of the arm 20, upon which the holder is mounted, I so adjust the diaphragms that they will be held when at work in such a position that the operator may at all times observe the working of either the recording or reproducing stylus without the necessity of changing his position or elevating the carriage.

Any suitable means, it will be understood, may be provided for holding the lever 24 in an adjusted position when the desired diaphragm is at work. This may be accomplished by means of a suitably-constructed spring or by simply providing that the journal 22 shall not turn freely in its bearing.

The inner end of the arm 20 terminates in the overreaching lip forming the seat 25 for the set-screw 26 and the depending terminal 27, the office of which is to provide a bearing-seat for the screw 28. The opposite end of the arm 20 terminates in a depending bearing-seat 29, which in like manner carries the threaded bearing-point 30, and the office performed by said bearing-points 28 30 is to adjust and hold in its operative position the knife-carrying shaft 31, the latter being provided with diametrical bores to receive said points.

The paring-knife 32 is attached to the shaft 31 at such a point thereon that its cutting edge will be disposed and adapted to follow the transcribing-stylus or to precede the recording-stylus. By this arrangement a paring mechanism is provided which will prepare the surface of the tablet for receiving a new record simultaneously with the action of the machine necessary to form such record upon the tablet. This result may be accomplished while either of the diaphragms is at work, as may be desired.

The shaft 31 terminates upon its inner end

in the operating-lever 33, which reaches inward along the inner edge of section 6 to a point opposite the protruding end of the set-screw 26, which is adapted to bear against the
 5 upperside of the lever for the purpose of overcoming the tension of the spring 34, mounted upon the inner edge of section 6, as shown. It will be seen that the free end of the spring 34 thus provided rests or bears against the
 10 under side of the lever 33, causing said lever to be normally elevated, though the degree of such elevation is fully controlled by the set-screw 26. This construction is more clearly brought out in Fig. 2 of the drawings,
 15 where it will be seen that by turning said set-screw home in its seat 25 the lever 33 will be depressed, resulting in the recession of the cutting-blade from contact with the tablet or control its cutting capacity, as may be desired. Turning the set-screw to effect its with-
 20 drawal enables the spring 34 to bring its tensile properties to bear against the lever, which by being elevated by such action causes the knife to engage with the tablet deeply or
 25 otherwise, as preferred.

In order that the tablet may be readily removed from its cylinder, I provide the laterally-swinging gate 35, connected to the frame of the machine by a suitably-formed hinge
 30 36. Said gate carries the bearing-point 37, which is adapted to engage with the diametrical bore provided in the cylinder-carrying shaft when the gate is closed.

In order to readily lock the gate in its operative position or open the same when it is desired to renew the tablet, I provide the locking-lever 38, mounted, preferably, upon the under side of the gate, substantially as shown—that is to say, said lever 38 is pivoted
 40 near its central section in the seat 39, the inner end of said lever reaching into engagement with the keeper 40, secured, as shown, to the frame of the machine. In order to hold the inner end of said lever for engagement with the keeper, I provide the spring
 45 41, one end of which is secured to the under side of the gate, while the free end thereof reaches downward and bears against the lever, or, if preferred, the spring may be attached to the lever and its free end arranged to bear against the under side of the gate,
 50 either construction subserving the same purpose. The outer end of the spring 38 has attached thereto the operating-handle 42, which reaches upward through a suitably-provided
 55 aperture in the arm and terminates in the knob or button 43 for manual control. By depressing the button 43 the outer end of the lever will be moved downward, while its inner
 60 end will be elevated, thus releasing such end from engagement with the keeper 40 and enabling the gate to be swung outward for access to the tablet. By swinging the gate in a closed position the bearing-point 37 will en-
 65 gage in the diametrical bore provided in the tablet-carrying cylinder and will be there

held in position by the locking device just described, as will be readily understood.

I desire now to call attention to the improvements involved in the production of my
 70 invention in diaphragms comprehending both the framework of the diaphragm and means for holding the diaphragm proper in its operative position and also for providing a greater
 75 resonancy for the complete device. The details of the formation of the same are clearly set forth in Figs. 4 and 8 of the drawings.

Referring to the various features involved in materializing my invention, 44 indicates the body proper, which is cup-shaped in form
 80 and is disposed in its operative position in an inverted condition and, is provided with the central opening or aperture 45 in its upper side, and the upper enlarged rim 46, provided on its outer edge with the milled surface 47.
 85

What may be termed the "internal" parts of my improved diaphragm are illustrated by the sections 48 49, the former adapted to receive the enlarged end of the latter, as shown. Said section 48 consists of the hollow body 49'
 90 and the suspended rim 50 erected thereon and held above the surface of said body by means of the supports 51. The inner face of the lower edge of the rim 50 is provided with the
 95 radial flange 52, and upon said flange the periphery of the plate forming the diaphragm proper, 53, is adapted to rest, where it is securely held by the lower edge or rim 54, provided upon the section 49. The section 48
 100 is provided with a diametrical bore, through which the link 55, connecting the stylus-arm with the diaphragm-plate, is designed to extend. By thus mounting the diaphragm-plate it will be seen that the same is held
 105 firmly in suspension and reliably to its work.

The sections 48 49 may have a screw-threaded connection or the enlarged end of the section 49 may be merely entered loosely within the rim provided upon the section 48, so as to reach the rim of the diaphragm-plate and
 110 bear firmly thereon, either form of connection for these parts being equally effective. When the sections 48 49 are assembled by entering the smooth or threaded rims, as the case may be, and thus causing the same to
 115 bear firmly upon the rim of the diaphragm-plate, they are entered in the open end of the body, causing the neck formed upon the section 49 to protrude through the aperture 45, adapting said neck for ready engagement
 120 with the usual flexible tube employed to convey sound to the operator.

Section 48, it will be seen, is provided with the radial enlargement or rim 56, which is threaded upon its outer surface and adapted
 125 for engagement with the threaded seat 57, provided in the open end of the body. This arrangement enables the said body to be firmly secured to said section 48, and thus enable the parts to be held reliably in their
 130 respective operative positions.

It will be seen from the construction above

set forth that the diaphragm-plate is very sensitively poised in position, enabling it to readily register and accentuate all sounds conveyed thereto by means of its link connection with the stylus. An equally-sensitive adjustment of the diaphragm-plate has not to my knowledge heretofore been made, and I therefore desire to call particular attention to this part of the invention.

By providing the threaded connection for the several sections involved in the formation of the diaphragm they may be firmly and rigidly connected together, practically producing a diaphragm body or holder of one piece, resulting in great sensitiveness of vibration. It will also be seen that by providing a threaded connection for the section 48 and the body proper and a plain or telescoping connection for the sections 48 49 all of the parts will be bound firmly together when said section 48 is turned home in the seat provided in the body proper. The location of the track 17 at one side of the cylinder is a valuable feature of my invention, as it effectively performs its office of supporting the carriage, yet does not obstruct the view of the operator from the other parts of the machine.

Having thus presented the details involved in the formation of my improvements in talking-machines, I will state that what I claim as new, and desire to secure by Letters Patent, is—

1. The combination with the carriage and the tablet-carrying cylinder, of a duplex diaphragm-holder, constructed substantially as described, and consisting of the frame, so formed that each end will rest in a different plane and having attached thereto the journal 22 and the operating-lever 24, as and for the purpose set forth.

2. In an elevating device for phonograph-carriages, the combination with the carriage of the lever 11, the shaft 12 connected thereto, the crank-arm attached to said shaft and anti-friction-rollers mounted upon said arm, all ar-

ranged and operatively combined as and for the purpose set forth.

3. The combination with a phonograph-carriage and tablet-carrying cylinder, of a paring device mounted upon said carriage and consisting of the shaft 31; an operating-lever attached thereto; center bearing-points for holding said shaft; a depending knife attached to the shaft and adapted to contact with the tablet at a point in advance of the recorder or following transcriber; a spring for normally holding said knife into engagement with the tablet, and a set-screw adapted to overcome said spring and regulate the cutting depth of said knife, substantially as and for the purpose set forth.

4. In a talking-machine the combination with the tablet-carrying cylinder, of a carriage, constructed substantially as shown, and provided with the diaphragm-carrying arm disposed radially with respect to the cylinder and adapted to form a seat upon its outer end for the diaphragm-holder and the paring-shaft, and upon its inner end provided with the bearing-seat for the set-screw 26 and the bearing-points 28 and 30, and anti-friction-rollers mounted upon the under side of said carriage, as and for the purpose set forth.

5. As an improvement in diaphragms the combination of the hollow plate-holding section; a suspended rim erected thereon; a terminal section having a collar or neck, substantially as described, adapted to bear against the diaphragm-plate mounted within said rim, and a housing adapted to partly inclose said terminal section and having a threaded connection with the hollow section and adapted to force the latter into close engagement with said terminal section, thus binding all the parts together, as and for the purpose set forth.

In testimony whereof I affix my signature in presence of two witnesses.

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No. 659,737.

Patented Oct. 16, 1900.

G. W. GOMBER.
TALKING MACHINE.

(Application filed Nov. 9, 1896.)

(No Model.)

4 Sheets—Sheet 1.

Fig. 1.

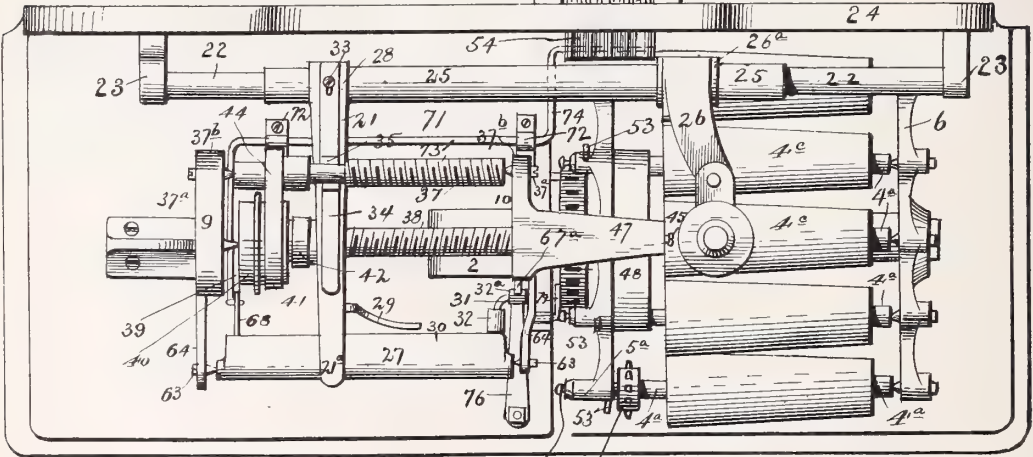
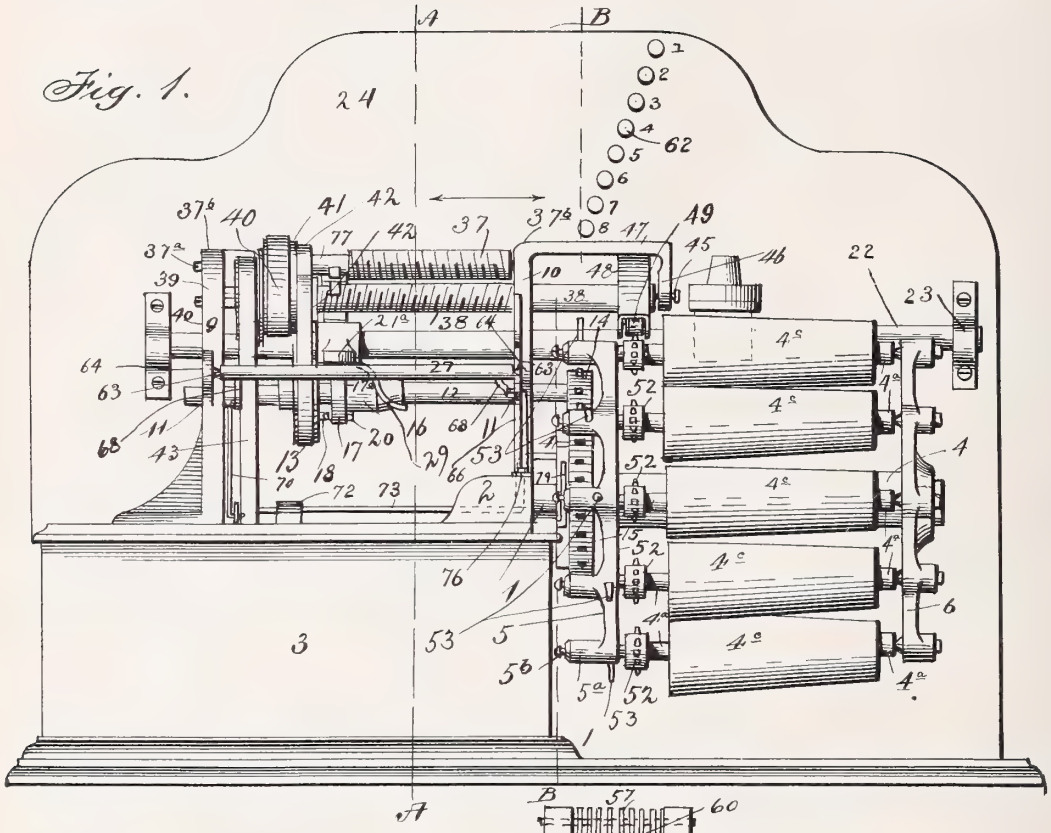


Fig. 2

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4 Sheets—Sheet 2.

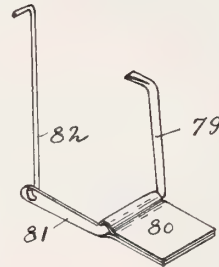
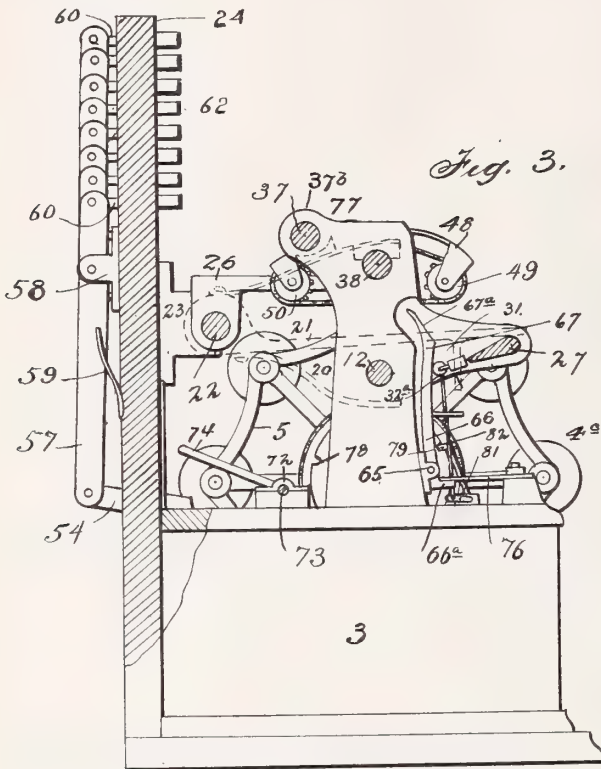
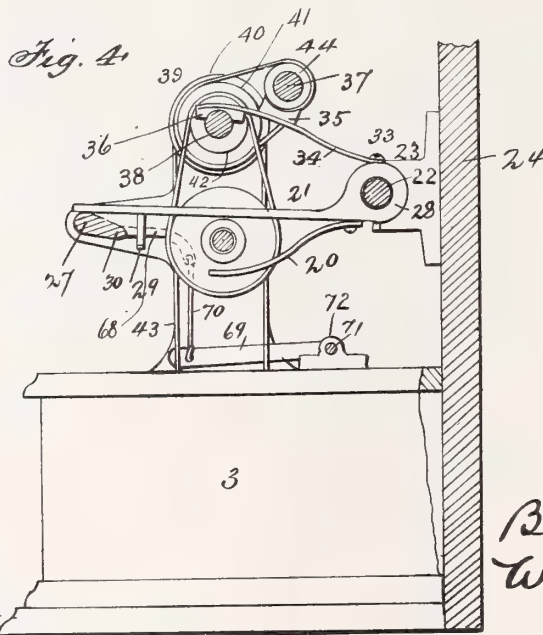


Fig. 10.



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4 Sheets—Sheet 3.

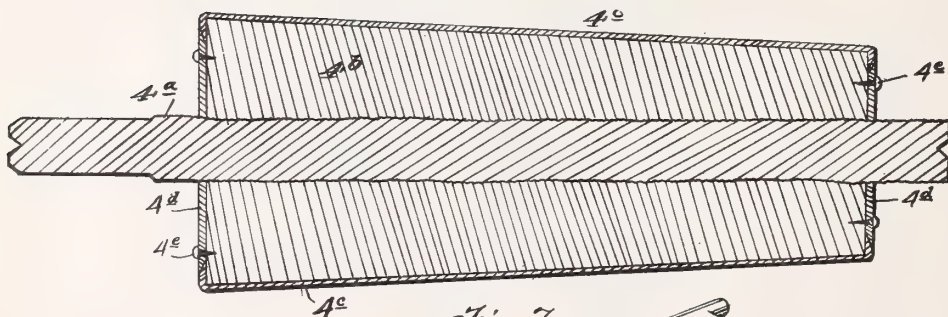
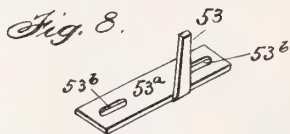
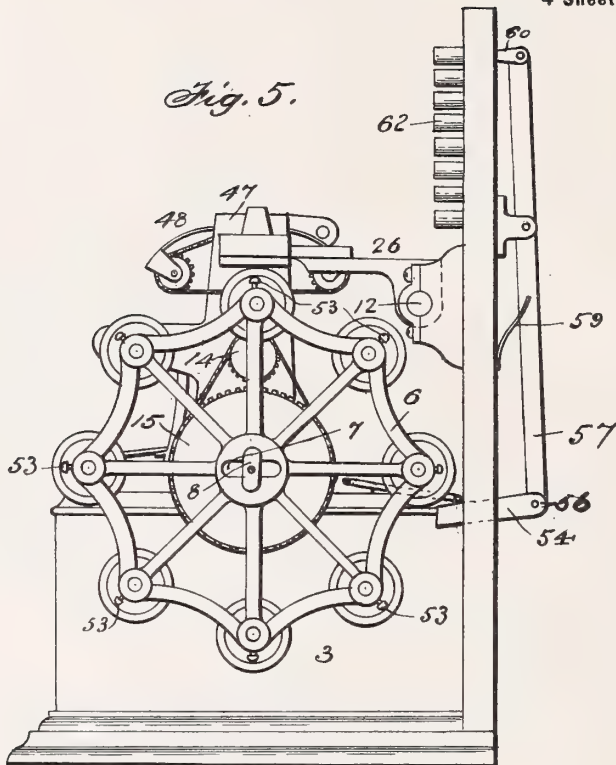
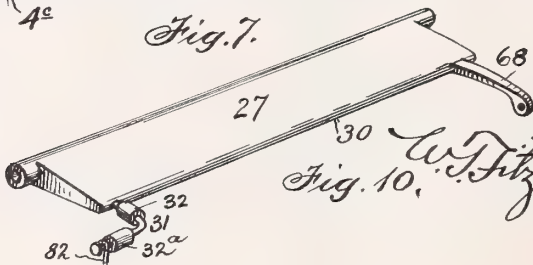


Fig. 7.



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(Application filed Nov. 9, 1896.)

(No Model.)

4 Sheets—Sheet 4.

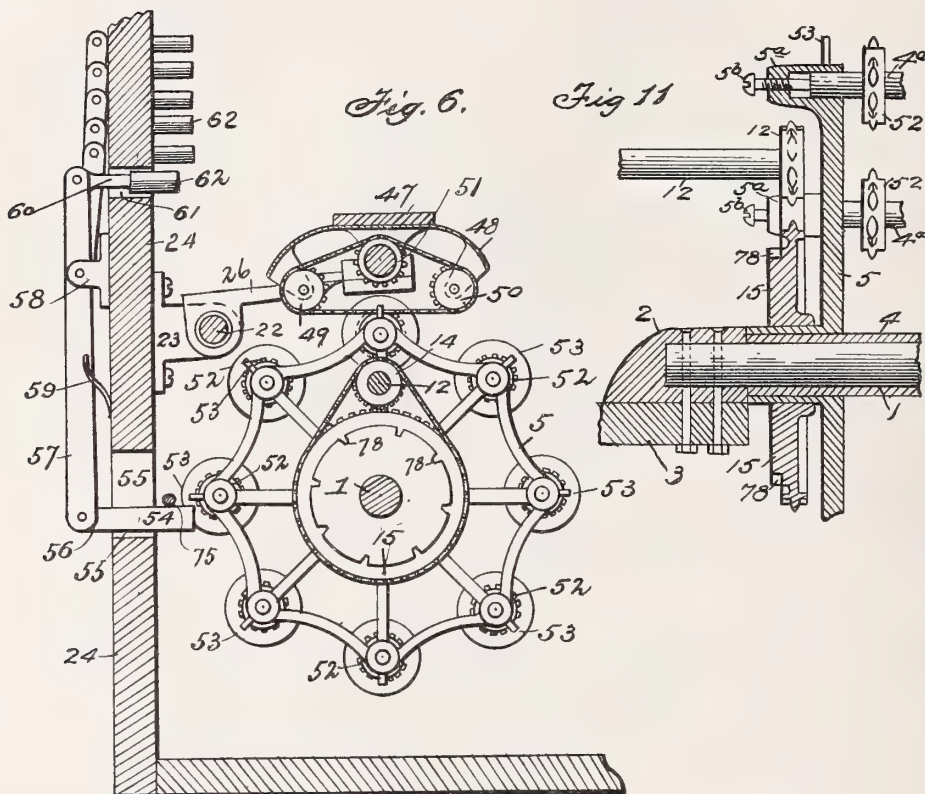
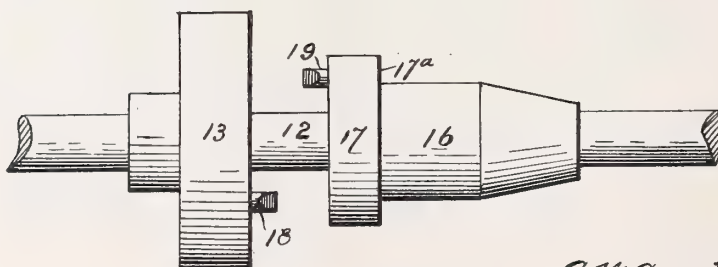


Fig. 9.



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UNITED STATES PATENT OFFICE.

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TALKING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 659,737, dated October 16, 1900.

Application filed November 9, 1896. Serial No. 611,562. (No model.)

To all whom it may concern:

Be it known that I, GEORGE W. GOMBER, a citizen of the United States, residing at Conyngham, in the county of Luzerne and State of Pennsylvania, have invented certain new and useful Improvements in Talking-Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in talking-machines of that class in which any preferred individual tablet in a plurality or magazine of tablets may be brought into operative relation with the recorder and reproducer.

The object, therefore, of my invention is to provide a talking-machine which shall have a plurality of tablets and shall combine in close coöperative relationship automatic means for bringing any selected individual of the series of tablets into operative relation with the "vibratory diaphragm" (by which term I desire to comprehend a recorder or reproducer) by simply dropping a coin in the slot prepared for its reception and pushing one of the series of buttons corresponding to the selected tablet.

Referring to the drawings, Figure 1 is a front elevation of my improved talking-machine in its complete operative position, showing the diaphragm in its initial position. Fig. 2 is a top plan view of Fig. 1. Fig. 3 is a sectional view of Fig. 1 on line A A looking toward the magazine and showing the position of the carriage and parts carried thereby by dotted lines. Fig. 4 is a sectional view on line A A looking to the left. Fig. 5 is an end elevation from the right side. Fig. 6 is a sectional view on line B B of Fig. 1 looking to the right. Fig. 7 is a longitudinal section of the tablet-cylinder and the shaft therefor. Fig. 8 is a detail perspective view of my preferred form of adjustable stop. Fig. 9 is a detail side elevation of the idler and reciprocating sleeve. Fig. 10 is a detail perspective view of part of the controlling mechanism for the outer end of the carriage. Fig. 11 is a detail view showing the supporting-axle and

the sleeve and the head 5 carried by said sleeve.

While, as previously stated, the essential features of my invention reside in the provision of a plurality of tablets and means for selectively bringing them into coöperation with the transcribing-stylus, yet there are certain accessories which bear an important relation to these elements and which will be hereinafter referred to as a part of my complete operative talking-machine.

In the employment of a magazine of tablets for the purpose stated I prefer to adopt that particular form of rotatable tablet-holder illustrated, consisting of a fixed shaft 1, secured at one end by a retaining-clamp 2, affixed to part of the frame 3, which part may also provide or form a housing for the motor. The inner end of the shaft 1 being thus secured in position the outer end is free and suspended, permitting the reception thereon of the snugly-fitting sleeve 4, to the inner end of which is rigidly secured the fixed head 5, while to the outer end thereof is detachably secured the removable head 6. The head 6 I prefer to detachably secure to the hub or sleeve 4 by providing in the end of said hub an elliptical bore 7, adapted to accommodate a clamp 8, formed to register with the elliptical opening when it is desired to remove the head and to rest transversely across said aperture and against the outer face of the head when in its securing operative position.

If preferred, an individual releasing device for each of the tablet-cylinders may be provided, though it is thought that by making provision for the simultaneous removal of all the tablets such means will be found amply sufficient to meet the requirements, as it will be seen that each of the shafts provided for the tablet-cylinders is well anchored in its bearings provided in the fixed head, thus enabling the removable head to be taken away, allowing the tablet-cylinders to remain in their respective positions until the ends of their shafts are removed from their bearing-seats.

Upon the housing 3 for the motor I erect the standards 9 10, which are adapted to af-

ford seats for various elements hereinafter referred to. In substantially the central section of the standards 9 10 I provide suitable bearings 11 for receiving the rotatable shaft 12, and upon said shaft, intermediate said standards, though nearer the former, I mount the idler 13. The inner end of the shaft 12 extends through its bearings 11 in the standard 10 and is provided with the pulley or sprocket 14, adapted to coöperate with the pulley or sprocket 15, secured to the axle-sleeve 4 on the inner end of the tablet-magazine. By means of said sprockets or pulleys, as the case may be, said magazine is rotated. Located upon the inner side of the idler 13 I provide the reciprocating sleeve 16, which terminates in the head 17 and is so keyed or feathered to the shaft 12 that it will rotate therewith, but will also have a reciprocatory movement thereon. The contacting faces of the idler 13 and the head 17 are provided with frictional points or pins 18 19, adapted for engagement with each other when the sleeve is moved toward the idler by the downwardly-extending arm 20, secured to the carriage-frame 21 and arranged to bear against the face 17^a of the head.

The carriage 21 is held in its operative position by the shaft 22, mounted in suitable brackets or supports 23, attached to a part of the frame 24, and is adapted to reciprocate on said shaft through the medium of the barrel or sleeve 25, loosely mounted on the shaft 22 and extending to the right sufficiently to provide a point of attachment and support for the diaphragm-carrying arm 26. By this arrangement the barrel or sleeve 25 may be freely moved in either direction upon the shaft 22, enabling the diaphragm to be moved into contact with the tablet. I prefer to so mount the arm 26 upon the barrel 25 that it will tightly grasp the same and have frictional contact therewith, permitting the diaphragm to be raised or lowered by simply overcoming the frictional grasp, when the diaphragm will be held in an adjusted position—that is to say, the arm 26 is provided with the collar 26^a, which tightly fits around the barrel 25, and while the frictional grasp of said collar may be overcome it will be understood that it will cling sufficiently to the barrel to hold the arm 26 in an adjusted position.

The carriage-frame 21 extends to the front part of the machine and rests by its extreme outer end 21^a upon the cam-faced shaft 27, while its inner end is rigidly secured to the barrel 25 by means of the body 28.

The outer end of the carriage-frame 21 has depending therefrom the obliquely-disposed finger 29, adapted to raise the inner edge or blade 30 of the shaft 27 when it comes in contact with the elbow 31, provided with the frictional rollers or sleeves 32 and 32^a.

Preferably upon the upper surface of the body 28 I secure the slotted end 33 of the spring 34, provided upon its upper surface,

near the intermediate part thereof, with the threaded block 35, and upon the under side of its outer end with a similar block 36, adapted, respectively, for contact with the threaded shafts 37 38, by means of which the carriage is moved in opposite directions. The shaft 37 is provided with threads running to the left, while the shaft 38 has threads running to the right, and as there is sufficient play permitted to the spring-arm 34 between the shafts 37 38 only one of the threaded blocks is in contact with its shaft at the same time, providing that the carriage will be moved to the right or the left, as the case may be. The shaft 38 is provided with a suitable bearing in the upper end of the standard 9 and with a graduated pulley 39, having the faces 40, 41, and 42, the first being designed to connect directly with the motor in the housing 3 by the belting 43. The face 42 is designed to connect by belting with the idler 13, while the face 41 coöperates with the pulley 44, provided at an opposite point thereto upon the shaft 37. The shaft 37 is also properly seated in bearings 37^a, provided in the extreme inner and upper extensions 37^b of the standards 9 10. The inner end of the shaft 38 passes loosely through an aperture provided in the upper end of the standard 10 and extends into engagement with the bearing-point 45, held in an adjusted position by the downwardly-extending section 46 of the lateral continuation 47 of the standard 10. It will be understood that all of said shafts may be provided with bearings of this character in order that a minimum amount of friction may result, though any desired form may be employed.

The lateral extension 47 is designed, in addition to providing a bearing for the extreme end of the shaft 38, to carry or suspend the sprocket-frame 48, in the outer ends of which are mounted the sprockets 49 50, intended to be actuated by the sprocket 51, mounted on the extreme end of the shaft 38. These sprockets when properly connected by a suitable belting are intended to act upon one of the sprockets 52, secured to the inner end of the shaft of the tablet-cylinder, and as the sprocket 51 is disposed slightly above the sprockets 49 50 the belting will reach across from the under side of said sprockets and freely contact with any preferred one of the sprockets 52 as its accompanying tablet is brought into coöperation with the diaphragm. For this purpose it is thought that a belting constructed of suitable pliable material provided with eyelets for engaging with the teeth of the sprockets will be found most suitable, though ordinary leather belting provided with suitable apertures to receive the sprocket-teeth will, it is thought, be found to be sufficient to meet the requirements, yet by protecting the edges of said apertures with metal eyelets a much longer life is imparted to the belting, rendering it more desirable for the purpose.

In order to hold each of the shafts 4^a of the

tablet-cylinders in its operative position and to accommodate a suitable form of bearing therefor, I provide upon the fixed head the inwardly-extending sockets 5^a, having a sufficient bore to loosely receive the inner ends of the cylinder-shafts 4^a, which are received and held in position by the adjustable bearing-points 5^b, axially seated in the ends of said sockets. The extensions or sockets 5^a also provide a seat upon their upper surface for the reception of a series of disaligned stops 53, so located that none will move in the plane or path of the others and designed to contact with their respective tumblers when the desired tablet is in apposition with the diaphragm.

Mounted in the rear part 24 of the frame of the machine, at a point on a line with the disaligned stops 53 and designed to contact by proper manipulation with their respective stops, I provide a series of tumblers 54, arranged to reach through suitable bearing seats or apertures 55 in the frame, while pivotally connected to the inner ends 56 of said tumblers is the operating-bar 57 for each of the tumblers 54, preferably extending upward from the point of their pivotal connection with the tumblers on the rear side of the frame and parallel therewith. Said apertures 55 are of sufficient extent to admit of a free upward movement of the tumblers 54. By this arrangement of the apertures the tumblers 54 will rest upon the lower end thereof and check the downward movement of their respective stops; but when the magazine is reversely rotated each will move out of the path of its stop when contacting therewith from the lower side. Each of the bars 57 is provided, preferably near its upper end, with a pivotal connection or bearing 58, secured to the rear side of the frame. Designed to normally withdraw the tumblers 54 is the spring 59, one end of which is anchored in the inner edge of the bar 57, while the free end thereof is arranged to bear against the frame, thus withdrawing the tumblers. To the upper ends of the bars 57 I pivotally connect the operating-lever 60, arranged to extend through suitable apertures 61, provided in the frame, to the front side thereof, where they terminate in or connect with suitable manipulating-buttons 62 for manual control. In order to dispose the series of operating-buttons thus provided within a convenient area and position, I prefer to graduate the length of the series of bars 57, arranging that the bar upon the right or left shall be shortest or longest, as may be preferred, and gradually increasing or diminishing the length of the other bar, as the case may be, resulting in the arrangement of the buttons in a line with each other, substantially as shown in Fig. 1. This is a preferred form of arrangement for the operating-buttons, though it will be understood that any convenient and preferred plan may be adopted for this purpose.

For cheap, and consequently expeditious, construction I prefer to form the bars and

tumblers 57 and 54, respectively, of wood, arranging that a simple saw-mark in the inner edges of said bar will provide a seat for the spring 59, though for more permanent construction it will be understood that these parts may be formed of any preferred material. By the disposition made of the spring 59 it will be observed that the respective button of each bar will be held normally outward, when a pressure upon said button will enable the tension of the spring 59 to be overcome, thus forcing the tumbler 54 into the path of its respective stop, all of which for convenience are designated by the numeral 53.

From the drawings and specification in this case it will appear that it is the function of the stops 53, respectively, to engage each its appropriate tumbler 54, and thereby to determine automatically which one of the tablets of the magazine shall assume operative relations with the vibratory diaphragm. The actuation of one tumbler causes the mechanism automatically to select a particular stop and no other. In like manner the actuation of another tumbler causes the selection of another stop, and so on throughout the complete series of stops. Now the employment of coöperative stops and tumblers is intended only to illustrate one mode of accomplishing an object that may be accomplished in a variety of ways and is representative in the broad sense of any mechanism that is adapted to select any one of a series of tablets in preference to any other. Therefore for brevity and convenience I denominate such mechanism "tablet-selective" mechanism, intending thereby to include any mechanism that is adapted, through the manipulation of a member—in the present example one of the tumblers 54—to select for operative relations with the vibratory diaphragm any individual of a series of tablets that may be determined upon irrespective of the relation in which the tablet selected may stand toward the other tablets of the series.

The cam-faced shaft 27 is mounted in suitable bearings 63, located in the outer ends of the brackets 64, the latter being so connected to the standards 9 10 that said shaft will be held slightly above though parallel with the shaft 12. At the foot of the standard 10 and at the forward edge thereof I provide the pivotal seat 65, arranged to receive the lower end of the standard 66, which extends upward parallel with said standard and is provided upon its upper end with the obtuse angle 67, presenting a cam-face 67^a for contact with the friction roller or sleeve 32^a, mounted upon the elbow 31, secured to the shaft 27. To the opposite end of the shaft 27 and extending inwardly therefrom parallel with the blade 30 I provide the controlling-lever 68, which has pivotal connection with the crank-arm 69 by means of the link 70. Said crank-arm is rigidly connected to or integrally formed with the rocking shaft 71, which is disposed parallel with the longitudinal line of the ma-

chine and is mounted in suitable bearings 72 and consists of the body-section 73, the transverse arm 74, and the terminal branch 75, adapted to bear upon the upper edge of the tumblers and prevent the upward extension or movement thereof. The connection between the shaft 27 and the rocking shaft is so made that the elevation of the edge or blade 30 will result in the depression of the terminal branch 75 into contact with the upper edge of the tumblers, preventing, as previously stated, an upward movement thereof until said branch has been elevated by the corresponding depression of the blade 30.

In order to automatically provide for the actuation of the terminal branch 75, I provide near the outer end of the carriage-frame 21 the inclined guide or radially-disposed finger 29, which will, as the carriage moves to the right, contact with the friction roller or sleeve 32 and cause the same to ride upon its inclined face, resulting in the elevation of the inner edge or blade 30 and the partial rotation of the cam-faced shaft. The elevation resulting from this contact of the friction-roller with the inclined face of the depending finger 29 causes the friction roller or sleeve 32^a to ride upward against the outer face of the lever 66 until the obtuse angle 67 has been reached, when the upper end 67^a of said lever will be forced outward against said sleeve, causing the same to ride upon the inclined face 67^a, through the action of the spring 76, so disposed that its free end will bear downward upon the outward extension 66^a of the lever. The opposite end of the spring 76 is suitably anchored at any preferred point where its office may be most effectively performed.

The operation of my improved automatic talking-machine may be described as follows: That is to say, the carriage is placed in its initial position at the extreme left end of the threaded shafts, when the diaphragm-arm is depressed, overcoming its frictional grasp upon the barrel 25, bringing the diaphragm into the plane of the surface of the tablet, which has first been placed in position by a pressure upon its corresponding button, duly labeled to indicate said tablet. The motor is then started, either manually or automatically, by aid of a suitable prime mover, when the threaded block 36 will engage with the shaft 38, resulting in the lateral movement of the carriage in unison with the threads provided on said shaft, causing the stylus, with its accompanying diaphragm, to follow the line of record provided on the tablet until the extreme outer end thereof is reached, when the depending radially-disposed finger 29 will engage with the friction-roller 32, elevating the elbow 31, and thereby causing the friction-roller 32^a to travel upward upon the face of the lever 66 until the obtuse angle 67 thereof is reached, when the action of the spring will force said lever outward, contacting the face 67^a of said lever with said roller, and complete the elevation of

the blade 30, incidentally causing said blade to act upon the outer end 21^a of the carriage and forcing the threaded block 36 out of engagement with the shaft 38 and bringing the threaded block 35 into coöperation with the shaft 37, effecting the reverse movement of the carriage. The elevation of the blade 30 also results in the upward movement of the controlling-lever 68, acting upon the rocking shaft 71 in such manner as to cause the terminal section 75 thereof to move downward into contact with the upper edge of the tumbler, holding the same in a horizontal position, preventing a continued reverse movement of the tablet-magazine.

It will be understood that each of the buttons controlling its respective tumbler will be labeled or designated in any preferred manner to correspond with the subject or selection inscribed upon the tablet located at its respective stop, enabling the operator to make a selection of a subject and bring the same under the reproducing-stylus by a simple pressure on the button.

The adjustment of the several parts is so made that the contact of the tumbler with its stop will place the desired selection under the stylus, bringing the sprocket 52 into engagement with the belting upon the sprockets 49 50, which latter, as previously set forth, are actuated through the medium of the sprocket 51, located upon the shaft 38. The movement, therefore, of the shaft 38, in addition to a positive actuation of the carriage, also rotates the tablet-cylinder, enabling the diaphragm to travel in harmony with the line of record.

In order to provide a construction for the tablet-cylinder which will compensate for the expansion and contraction incident to changes in the temperature, I prefer to provide that the surface of the shaft 4^a for the cylinder-body 4^b shall be suitably roughened or finely corrugated, upon which is shrunk or forced the body proper, 4^b, preferably made of light porous wood, cork, or the like, while upon the outer surface thereof I secure a covering 4^c, of a flexible and loosely-formed fibrous material—such, for instance, as canvas, canton-flannel, or the like—the object being to provide for the free expansion and contraction of the material forming the tablet.

The stops 53 may consist for cheap and efficient construction of a series of screw-threaded lugs or points properly seated in the outer face of the sockets in such manner that each will engage with its respective tumbler and be disposed in an entirely-different path from the other, or said stops may consist of the adjustable device shown in Fig. 8 and consisting of the plate 53^a and the integrally-formed point 53. In either end of the plate I provide the slotted apertures 53^b, designed to permit longitudinal movement of the plate 53^a, that the stop may be properly adjusted. If the form of stop consisting of the threaded lug or point be employed and it should be

necessary to readjust it after it is seated in the outer face of the socket, such readjustment can easily be effected by simply bending the point in the direction desired, which of course will be readily appreciated.

Upon the shaft 12 is mounted the idler 13 and the sleeve 16, as previously stated, and said sleeve is designed to coact with the depending arm 20, provided upon the carriage-frame 21, as follows: When the carriage has moved back into its initial position, the bearing-block 35 will drop into the groove 77, (said groove being a reduced portion of the shaft 37,) when the blade 30 will tend further to elevate the carriage-frame 21 and its accompanying depending arm 20, bringing it to bear against the face 17^a of the sleeve, forcing said sleeve and the friction-point 19 thereon into engagement with the idler and the friction-point 18, secured thereto, thus connecting said idler to the shaft and resulting in its rotation and incidentally rotating the sprockets 14 15, causing a reverse movement to be imparted to the tablet-magazine until the stop bearing upon the upper side of its tumbler is moved entirely around to contact with the lower side thereof, thus bringing the magazine to a full stop, owing to the interposition of the terminal section 75.

It will of course be understood that I do not wish to be confined to the use of belting as a means for communicating power from one pulley to another, as toothed gearing or other equivalent may be used, if preferred. For instance, the sprockets 14 15 may be toothed gearing arranged to mesh with each other in the usual manner, thus dispensing with the necessity of other means for forming connection. The same may be said with reference to the sprockets 51 52 and other parts now shown as connected by belting.

In order to make it clear how I retain a flexible covering of felt, canvas, or other preferred material upon the porous body of the tablet-cylinder, I will state that said covering may be so placed that the projecting edges thereof will extend past the ends of the body of the cylinder, where they may be drawn inward toward the shaft and there secured against the ends of the body by a suitable retaining-plate 4^d and retaining-screws 4^e or other preferred means, taking through said plates into the body.

In order to provide that the tablet-magazine will be reliably held in an adjusted position, to the end that the subject-matter upon any preferred tablet may be transcribed, I arrange the locking mechanism for the magazine, (more clearly shown in Figs. 3, 5, 6, and other views,) and which I will describe by stating that the sprocket or gearing wheel 15 is provided upon the face thereof or other preferred point with a series of notches or teeth 78, adapted for engagement with the detent or pawl 79. The lower end of the detent 79 is pivoted in a suitable seat 80, mounted at any convenient point to enable it to per-

form its office. The said detent after passing through the seat provided therefor terminates in the crank-arm 81, which is pivotally connected to the free end of the elbow 31 or any convenient point of the blade 30 by means of the link-arm 82. By this arrangement of the several parts just described it will be apparent that I have provided an efficient locking device for the tablet-magazine when any preferred one of the tablets is being transcribed.

The operation of the locking device may be stated as follows: When the elbow or inner edge of the blade, to one of which the link-section 82 is attached, is depressed, the crank-arm 81 will be moved downward, forcing the free end of the detent into engagement with one of the notches or ratchets 78, thus locking the sprocket or gearing 15 against movement until the detent is withdrawn. The downward movement of the elbow or blade just referred to occurs only when the diaphragm is brought into coöperation with the tablet, consequently resulting in holding the magazine in a fixed position until the diaphragm has traveled the entire length of its tablet. When the stylus has transcribed the entire line of record, the diaphragm is automatically returned to the starting-point, as already described, through the elevation of the blade 30, which act results in the withdrawal of the detent 79 from engagement with the sprocket 15, permitting another selection from the magazine-tablets to be made.

Having thus fully described the operation and construction of my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a talking-machine, a sound reproducer or recorder, a series of sound-records, a carrier therefor, means for bringing any sound-record into coöperative relation with said sound reproducer or recorder, and stop mechanism for stopping any desired record when it is brought into coöperative relation with the sound reproducer or recorder, as set forth.

2. In a talking-machine, the combination with a frame, a recorder or reproducer, a series of tablets and a tablet-carrier, of automatic means for bringing any selected individual of the tablets into operative relation with the sound reproducer or recorder, and a push-button for releasing and mechanism for stopping said means, as set forth.

3. In a talking-machine, the combination with a frame, a recorder or reproducer, tablets and a tablet-carrier, of automatic means for bringing any selected individual tablet into operative relation with the sound reproducer or recorder, and a device for releasing and mechanism for stopping said automatic means, as set forth.

4. In talking-machines having a plurality of tablets, and provided with a recorder and reproducer and a series of buttons, automatic means for bringing any selected tablet into operative relation with the recorder or repro-

ducer which are released by pushing one of said buttons corresponding to the selected tablet, as set forth.

5 5. In talking-machines, a series of tablets, a recorder and reproducer, a rotatable tablet-carrier, and automatic means for bringing any selected one of said series into operation and means for holding it until operated upon by the recorder or reproducer, as set forth.

10 6. In a talking-machine the combination with a frame, sound-receiver, tablet-magazine and magazine-driving mechanism, of a plurality of tablets carried in the magazine, and a corresponding plurality of magazine-
15 stop mechanisms, adapted through manipulation thereof respectively to release the driving mechanism and stop any one of the tablets when in operative relation with the sound-receiver, substantially as set forth.

20 7. In talking-machines, the combination of a magazine of tablets, means to actuate the same, a diaphragm, a series of graduated stops carried by said magazine, and means coöperating with the stops for checking and holding
25 the desired tablet when in coöperative relation with the diaphragm, as set forth.

8. In a talking-machine, the combination with a tablet-magazine having a fixed and a removable head, of a series of graduated stops
30 so arranged in the periphery of the fixed head that they will coöperate with the stop mechanism, designed to hold any preferred tablet into coöperation with the recording-stylus, and means for automatically reversing the
35 movement of the carriage and for sending it back to the initial point, substantially as described and for the purpose set forth.

9. As an improvement in talking-machines, the combination with the tablet-magazine and
40 diaphragm-carriage; graduated stops on said magazine; a series of tumblers; a rocking shaft; a series of buttons; suitable connection between said tumblers and buttons and means mounted on said carriage for actuat-
45 ing said rocking shaft and thereby locking the tumblers, substantially as specified and for the purpose set forth.

10. As an improvement in talking-machines, the combination of a magazine of tablets; a diaphragm, means for bringing the tablets into coöperative relation with the diaphragm, a series of graduated stops carried
50 by said magazine and means intermediate the carriage and stops for coöperating with said stops for checking the rotation of the magazine and holding the desired tablet thereon in coöperation with the diaphragm, substantially as specified and for the purpose set
55 forth.

60 11. As an improvement in talking-machines, the combination with the tablet-magazine and diaphragm-carriage and a series of tumblers, of means, substantially as described, for automatically reversing and continuing the movement of the carriage and for
65 locking the tumblers against upward move-

ment, substantially as described and for the purpose set forth.

12. As an improvement in talking-machines, the herein-described diaphragm-carriage-reversing mechanism consisting of the
70 cam-face rock-shaft, a spring-controlled lever for holding the inner edge of said shaft normally depressed, and means mounted upon the carriage for overcoming the tension
75 of the spring in said spring-controlled lever, thereby elevating the inner edge of said shaft when the line of record has been transcribed, substantially as described and for the purpose
80 set forth.

13. As an improvement in talking-machines, the combination with a plurality of tablets and a diaphragm-carriage, of a depending arm mounted on said carriage, a
85 sleeve so disposed upon its shaft that it will rotate therewith and slide thereon when actuated by said arm, and an idler-pulley arranged to contact with said sleeve, and rotate therewith when they are forced together, and thereby reverse the movement of the
90 magazine, as and for the purpose set forth.

14. In a reversing mechanism for tablet-magazines, the combination with the diaphragm-carriage, of a driving-shaft for said
95 magazine having a sprocket fixedly secured to the inner end thereof designed to coact with the sprocket on the magazine-axle; an idler mounted on said shaft; a sleeve loosely keyed thereon and a depending arm connected to the carriage adapted to slide said
100 sleeve into engagement with the idler when the carriage has moved back to its initial position, thereby causing said idler to rotate on its shaft, as and for the purpose set forth.

15. As an improvement in talking-machines, a tablet-magazine and means for
105 checking the rotation of the same, consisting of a series of graduated stops secured to the outer side of the spindle-sockets, a series of tumblers for engagement therewith, a series
110 of bars, each designed to act upon its respective tumbler, a series of buttons for actuating said bars, and individual springs for said bars disposed to normally withdraw each
115 tumbler from the path of its stop as and for the purpose set forth.

16. The combination with a rotatable tablet-magazine of a series of stops carried thereby; a series of tumblers for engaging there-
120 with; a series of bars, each designed to act upon its individual tumbler; a series of buttons for manipulating said bars and suitable means for disposing said buttons normally
125 inward and thereby holding each tumbler out of the path of its individual stop, as and for the purpose set forth.

17. As an improvement in talking-machines, the combination with a recorder or
130 reproducer and a tablet-magazine, of stop mechanism for said magazine, consisting of a series of graduated stops and tumblers therefor; a series of buttons corresponding to each

individual tablet, and means intermediate said buttons and stops, whereby a pressure upon one of the buttons will hold one of the tumblers in such position that it will contact
 5 with the stop of the desired tablet and thereby hold said tablet into coöperation with the recorder or reproducer, substantially as specified and for the purpose set forth.

18. As an improvement in talking-machines, the combination with a transcribing-stylus a tablet-magazine, stop-mechanism therefor, consisting of a series of graduated stops; a series of buttons referring respectively to an individual tablet, and means for
 15 so connecting said buttons and stops that a pressure upon one of the former will hold one of the latter in such position that the desired tablet will be locked in coöperation with the transcribing-stylus, substantially as described
 20 and for the purpose set forth.

19. In talking-machines, the combination with a tablet-magazine, means to actuate the same, a diaphragm-carriage and a series of tumblers, of means coöperating with said

tumblers for checking the magazine and operating the diaphragm-carriage, as set forth. 25

20. In a talking-machine, a diaphragm-carriage a tablet-carrier, and means for operating the same, a series of tumblers, and means coöperating therewith for checking the tablet-carrier and means for operating the diaphragm-carriage, as set forth. 30

21. In a talking-machine, a sound reproducer or recorder; a magazine adapted to carry a plurality of tablets; automatic means for bringing, at will, any selected individual of the tablets into coöperation with the recorder or reproducer, and additional means for stopping and holding it until operated upon by said recorder or reproducer, as set forth. 35 40

In testimony whereof I affix my signature in presence of two witnesses.

GEORGE W. GOMBER.

Witnesses:

W. H. KNELLY,
 H. F. GOMBER.

No. 659,738.

Patented Oct. 16, 1900.

G. W. GOMBER.
TALKING MACHINE.

(Application filed Feb. 24, 1897.)

(No Model.)

2 Sheets—Sheet 1.

Fig. 1

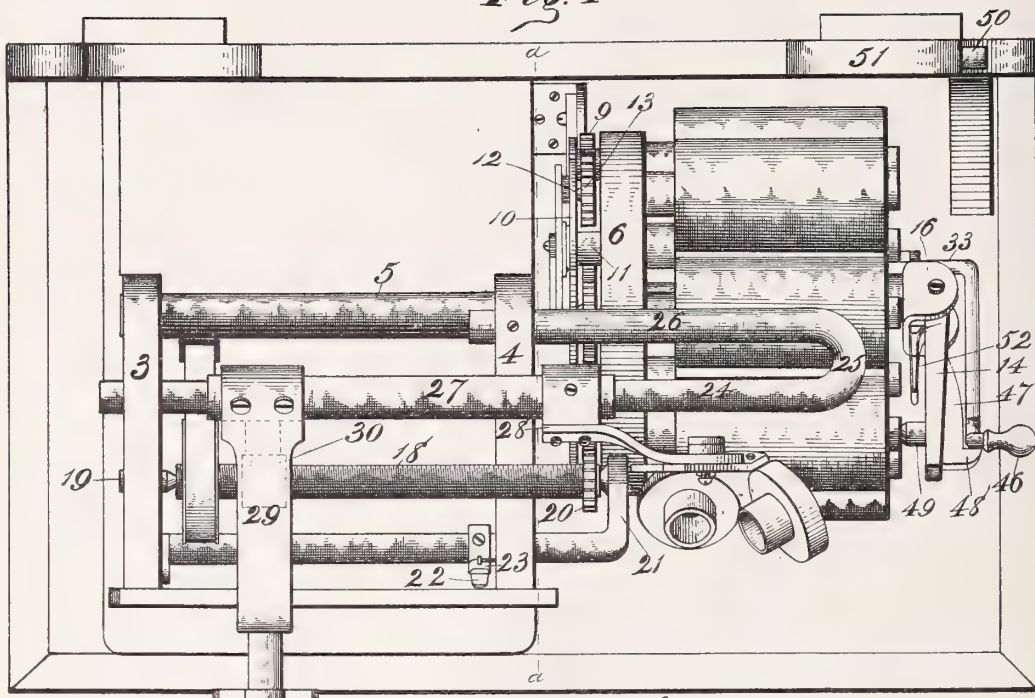
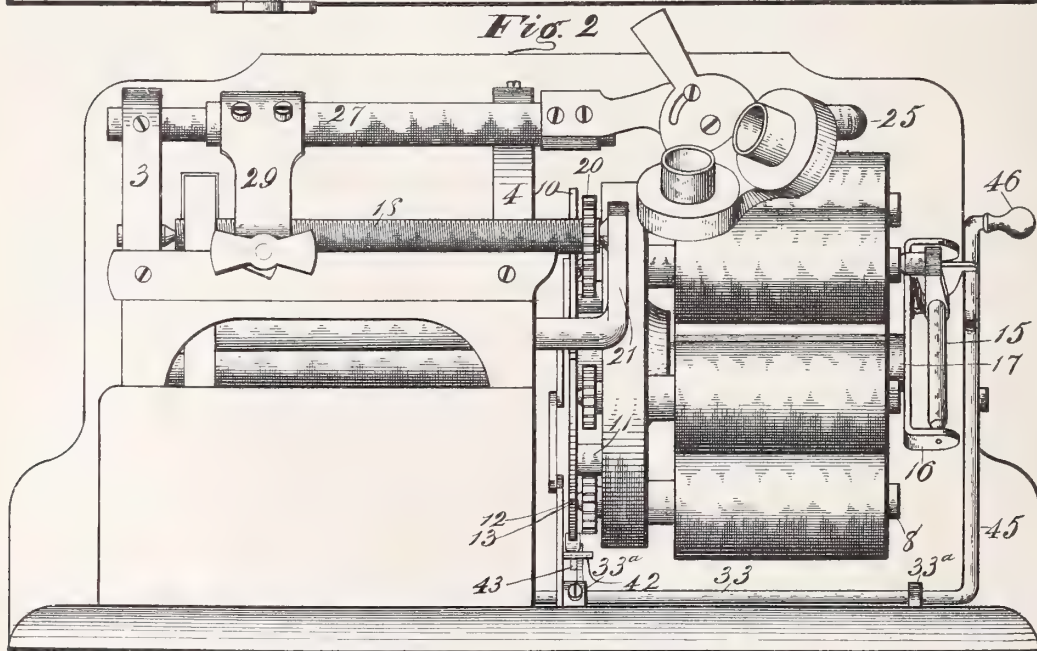


Fig. 2



Witnesses

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No. 659,738.

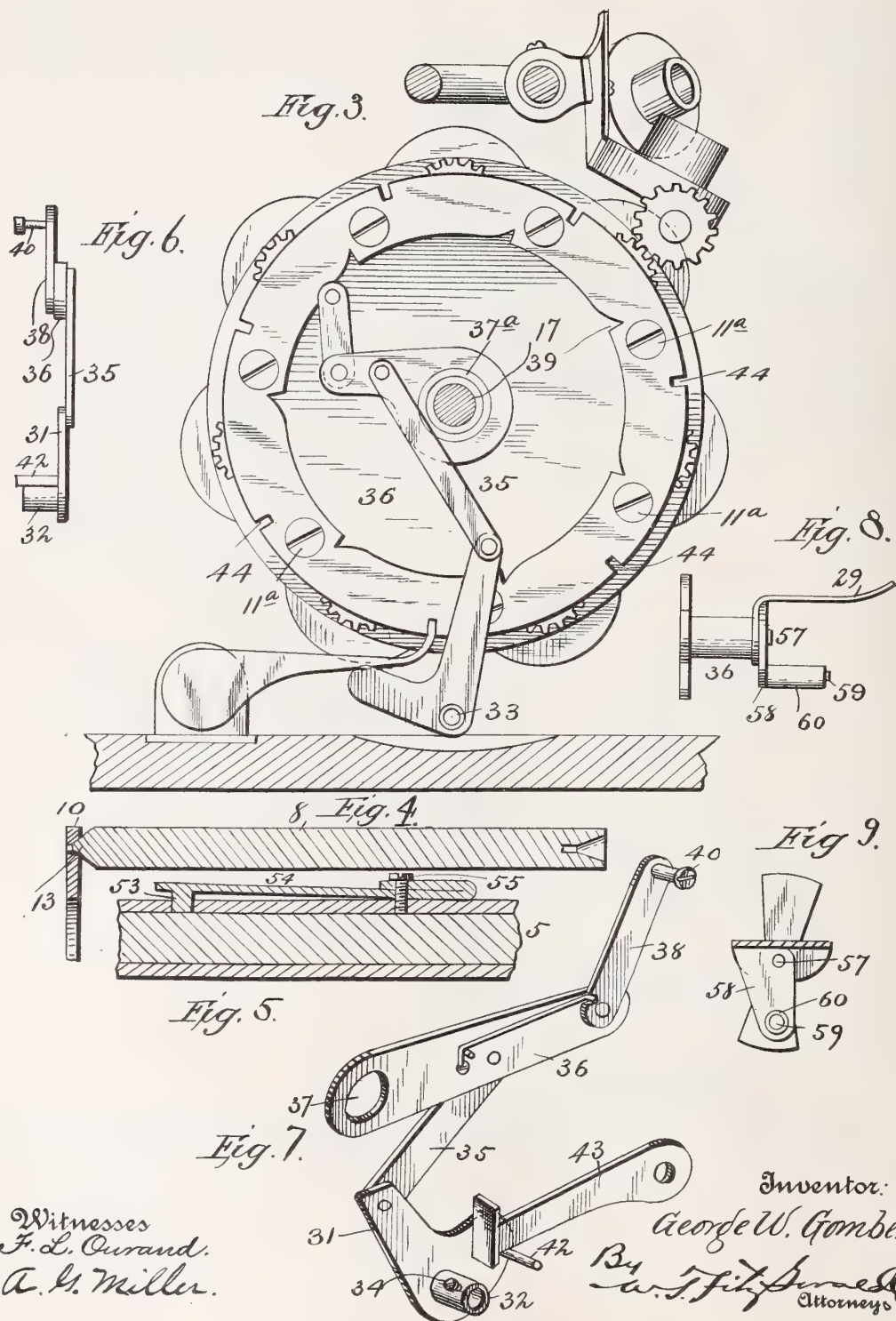
Patented Oct. 16, 1900.

G. W. GOMBER.
TALKING MACHINE.

(Application filed Feb. 24, 1897.)

(No Model.)

2 Sheets—Sheet 2.



Witnesses
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UNITED STATES PATENT OFFICE.

GEORGE W. GOMBER, OF CONYNTHAM, PENNSYLVANIA, ASSIGNOR, BY
MESNE ASSIGNMENTS, TO THE AMERICAN MULTIPLEX TALKING
MACHINE COMPANY, OF WEST VIRGINIA.

TALKING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 659,738, dated October 16, 1900.

Application filed February 24, 1897. Serial No. 624,823. (No model.)

To all whom it may concern:

Be it known that I, GEORGE W. GOMBER, a citizen of the United States, residing at Conyntham, in the county of Luzerne and State of Pennsylvania, have invented certain new and useful Improvements in Talking-Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to talking-machines, and more particularly to that class thereof wherein a plurality of tablets are so grouped that any one of said tablets may be readily placed into coöperative relationship with the recorder or reproducer.

The object of my invention is to provide a talking-machine having a magazine designed to carry any desired number of tablets and render it possible to bring any preferred tablet in position ready for being acted upon by the recorder or reproducer, it being understood that the said magazine is manually controlled through certain mechanism, the details whereof will be fully set forth in the following specification and illustrated in the accompanying drawings, in which—

Figure 1 represents a top plan view of my complete talking-machine. Fig. 2 is a front elevation thereof. Fig. 3 is a section of Fig. 1 on line *a a*. Fig. 4 is a longitudinal section of the tablet spindle-shaft, showing part of the cylinder-head. Fig. 5 is a sectional view of the magazine-axle, showing the friction clutch or brake therefor. Fig. 6 is a side view of the controlling mechanism for the magazine. Fig. 7 is a perspective detail of the parts shown in Fig. 6. Fig. 8 is a side view of the carriage-elevating device, and Fig. 9 is an inner end view thereof.

In materializing my invention I provide the base 1, upon which is mounted a motor-receptacle 2, and upon said receptacle I erect the brackets 3 and 4, designed to hold the several parts of my invention in their respective operative positions. Upon the top of said receptacle I mount in said brackets the supporting axle or shaft 5, the free end of

which extends over the base 1 and is designed to hold the magazine rotatively in position. The magazine consists of the head 6, which is provided with a series of bearing seats or sleeves 7, of any preferred number, each bearing-seat being arranged to extend outward sufficiently to provide a reliable support for holding the spindle-shafts 8 to their work. Said shafts, it will be observed, extend entirely through the bearings and the head 6 and have attached to their protruding ends the gears 9.

In order to reinforce the bearing-seats 7 in their work of holding the spindle-shafts in position, I attach to the inner face of the head 6 the ratchet-plate 10 in any suitable way, as by bolts or screws extending through the tubular sections 11 into engagement with said head, the object of the tubular sections being to hold the plate 10 a proper distance from the head.

I provide on the inner side of the plate 10, at points opposite the inner ends of the shafts, suitable bearing-seats 12, adapted to receive a bearing-point 13, formed upon the shaft. The free ends of said shafts are provided with the tablet-carrying body-section, and in order to secure the free ends of the shafts and properly support the same while the tablet carried thereby is being recorded or transcribed I provide the arm 14, rigidly secured to the rocking shaft 15, held by center points in the bracket 16, which is rigidly secured to the outer end of the axle 5. The head 6 is secured to the sleeve 17. Said sleeve may consist of a tubular shaft of sufficient bore to snugly receive the axle upon which it is desired to freely rotate in either direction.

I adjustably mount in the brackets 3 4 the threaded shaft 18, the outer end of which is secured by the center point 19, mounted in the bracket 3, while the inner end is provided with a suitable gear 20, designed to mesh with one of the gears 9 and adjustably held in position by the spring-controlled rocking finger 23. By this arrangement of the rocking arm 21 it will be observed that the gear 20 has the capacity of moving out of the path of the gears 9 when the magazine is rotated to bring

the desired tablet into coöperation with the diaphragm. I also secure with the standards 3 4 the carriage shaft or track, which consists of a main section 24, the curved end 25, and the anchored terminal 26. The track is rigidly held by the standards, and designed to reciprocate upon the section 24 is the barrel 27, adapted to carry the diaphragm-arm 28 and the guiding-arm 29, having a suitably-mounted threaded block 30 for coöperation with the threaded shaft 18.

In order to rotate the magazine and automatically lock the same when the desired tablet has been brought into alinement with the diaphragm, I provide the compound pawl illustrated in Fig. 7, consisting of the base member 31, having the sleeve 32 arranged to receive the rocking shaft 33 and become fixedly attached thereto by means of the set-screw 34. Pivotaly attached to the base member 31 is the link 35, the upper end of which is pivotaly attached to the arm 36, provided with the aperture 37, designed to loosely receive the axle 5 or sleeve 17, mounted thereon.

Pivotaly connected to the arm 36 is the detent or pawl proper, 38, arranged to engage with one of the ratchets 39 upon the edge of the plate 10 or coöperate with said ratchets by means of the stud 40. In order to hold the pawl 38 in an extended position, I provide the spring 41, secured to the arm 36 at one end, while the free end is so disposed that it will engage a notch upon said pawl. The base member 31 is also provided with the finger 42, adapted to elevate the free end of the detent 43 when the magazine has been brought into an adjusted position by the operation of the rock-shaft 33. Said detent 43 is pivoted in a suitable seat 43^a. The free end of the detent 43 engages one of the recesses or notches 44, arranged upon the periphery of the plate 10, as more clearly shown in Fig. 3. The rocking shaft 33 extends outward to the end of the base 1 and is mounted thereon in suitable bearings 33^a. The outer end of the shaft 33 has the upwardly-extending lever-section 45, which terminates in a suitable handle 46. The arm 14 is provided with the laterally-curved lip 47 and the stop 48, as fully set forth in Fig. 1. The office of the rocking shaft 33 is twofold, its first work being to operate the compound pawl, and, secondly, to cause the arm 14 to move inward, and thus force the bearing-point 49 into engagement with the bearing-seat provided in the ends of the shafts 8 when the desired tablet is in alinement with the recorder or reproducer. As the lever 45 is moved rearwardly against the stop 50, attached at a convenient point to the casing 51, the shaft 33 is partly turned, causing the compound pawl fixedly connected thereto and pivotaly attached to the axle to so move that the pawl 38 will withdraw from engagement with the succeeding ratchet, when by reversing the movement of the lever 45 until the upper end thereof engages the

stop 48 upon the arm 14 the pawl will extend into engagement with the contiguous ratchet and rotate the magazine, and it will be observed that at the instant said pawl is fully extended the arm 14 will be moved inward by the action of said lever, thereby causing the bearing-point 49 to take into the seat in the end of the tablet-spindle. The act of operating the compound pawl will lock the arm 14 into engagement with the tablet-spindle. The simple act, therefore, of operating the lever 45 actuates the magazine and locks it in an adjusted position. The arm 14 is held normally outward by the spring 52 to insure that the bearing-point 49, carried by said arm, will be withdrawn from the path of the tablet-spindles while the magazine is being rotated. As a result of bringing the lever 45 forward, more or less impetus is imparted to the magazine, and in order to overcome this movement I provide the friction contact-point 53, attached to the spring-plate 54, which in turn is secured to the sleeve 17 by the set-screw 55. The point 53 reaches loosely through an aperture provided in said sleeve into direct contact with the axle 5, and by regulating the tension of the spring 54 by means of said set-screw 55 the degree of friction set up between said point and axle is easily regulated, thus making it possible to freely rotate the magazine in either direction without permitting the impetus of the movement to carry a preferred tablet-spindle past its point of coöperation with the bearing-point 49.

In order to readily elevate the arm 29 out of engagement with the threaded shaft 18, I mount upon the outer arm, as shown in Fig. 8, the cam-lever, consisting of the sleeve 56, attached to said arm, the shaft 57 in said sleeve, the crank-arm 58, attached to said shaft, and also the finger 59, attached to said crank, and antifriction-roller 60 upon said finger.

By reference to Fig. 8 it will be seen that the outer end of the arm 29 is bent downward at right angles to the body portion, and said downwardly-extending section is provided with a suitable aperture designed to receive the inner end of the sleeve 56, it being understood that said inner end may be slightly reduced, if desired, in order to prevent the sleeve from having a longitudinal movement in said aperture, though permitting the same to be easily rotated in order to operate the finger 59 and cause said finger to bear upon a contiguous portion of the frame, and thereby elevate the arm 29, so that the block carried thereby will be raised out of coöperation with the threaded shaft 18.

In Fig. 13 it will be observed that the crank 58 is substantially triangular in outline, the shaft 57 being connected to one angle, while the opposite angle 61 is sufficiently shortened to form the lower end of the crank-arm and its accompanying finger to pass the center of the shaft 57 when the operating-handle 62 is properly manipulated. When the finger 59

is moved toward the left, the arm 29 is dropped sufficiently to cause the threaded block to co-operate with its shaft, when the reverse movement of said handle will move said finger to the right until it is past the dead-center, as indicated by the center of the shaft 57, when the point 61 will bear against the arm 29, and thus hold said arm in an elevated position, which will permit the carriage to be freely moved to an initial point.

By means of the construction of my compound pawl for actuating the magazine the result is a differentiated movement of said magazine—that is to say, the first movement of the shaft 33 causes the rapid extension of the pivoted parts forming said pawl; but as the operating-lever 45 is brought near the arm 14 such movement of the magazine, owing to the peculiar construction of said pawl, is checked until a very slow movement results at the time the desired tablet is in position for coöperating with the bearing-point upon the arm 14. The act of rotating the shaft 33, it will be observed, causes the upper end of the base member 31 to move outward, promptly acting upon the link 35; but after the pivoted point of said member and link passes the center or the extreme point of extension a withdrawing movement will be imparted to said link, thus preventing further pressure of the pawl 38 upon one of the ratchets 39. The time of the passage of the pivoted parts past the center or extreme point of extension marks the withdrawal of the stop 38, preventing further movement of the magazine, and at this instant the point upon the arm 14 takes into the bearing-seat provided for it in the end of one of the tablet-spindles. The outward movement of the upper end of the base 31 also elevates the finger 42, resulting in forcing the detent 43 into registration with one of the notches 44 at the instant said bearing-point engages the spindle, thus insuring harmonious coöperation of the several parts.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In talking-machines, the combination of a rotatable magazine having a supporting-axle and means for operating the same con-

sisting of a rock-shaft, a compound pawl attached to said shaft and to the axle of the magazine, an operating-lever connected to said shaft, and a pivoted arm secured to said axle and normally held in the path of the lever, all arranged as set forth.

2. In talking-machines, a rotatable magazine adapted to carry a plurality of tablets, each tablet-spindle on said magazine having a driving-gear, in combination with a driving-shaft having a transmitting-gear upon its free end adapted to coöperate with the spindle-gears, the outer end of said shaft being movably mounted upon a rocking arm 21 and suitable means to hold said arm normally downward whereby the transmitting-gear will be permitted to move out of the path of the spindle-gears, all substantially as specified and for the purpose set forth.

3. In talking-machines, a magazine having a plurality of tablet-spindles, each spindle having an actuating-gear, in combination with a driving-shaft having a transmitting-gear designed to coöperate with said spindle-gears, the end of said shaft carrying said transmitting-gear being mounted upon a movable arm, a spring adapted to so hold said arm that the transmitting-gear will be disposed in the path of the spindle-gears, though permitting it to have the power to move out of said path when it is desired to pass any one of the spindles without operating it, all substantially as specified and for the purpose set forth.

4. In talking-machines, a rotatable magazine having a plurality of tablets, a transmitting-gear secured to the shaft of each tablet; a driving-gear adapted to coöperate successively with said transmitting-gears and means substantially as described whereby said actuating-gear is automatically moved out of the path of the transmitting-gear though normally disposed in said path all arranged as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

GEORGE W. GOMBER.

Witnesses:

D. W. FAUST,
CHAS. BAUK.

No. 659,739.

Patented Oct. 16, 1900.

G. W. GOMBER.
PHONOGRAPH.

(Application filed Apr. 8, 1897.)

(No Model.)

2 Sheets—Sheet 1.

Fig 1

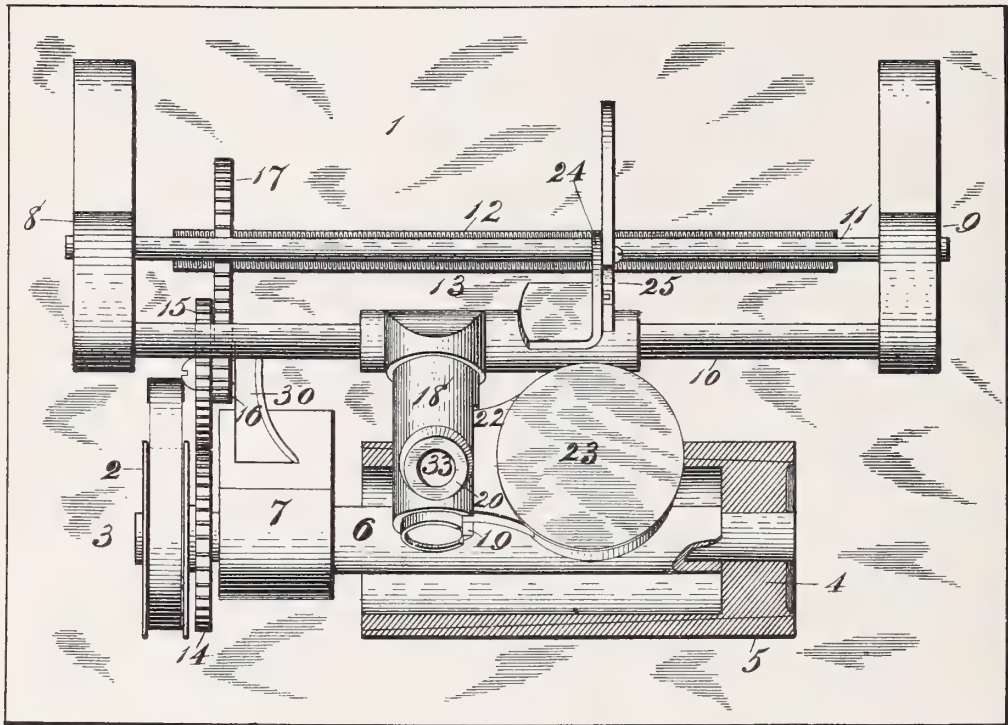


Fig 4

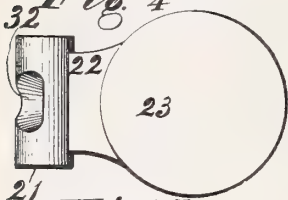


Fig 3

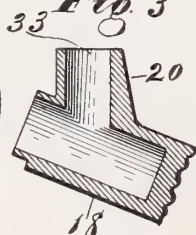


Fig 2

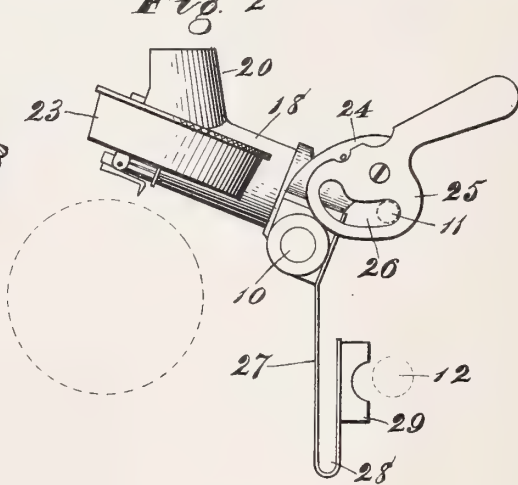


Fig 5

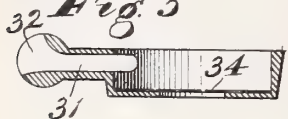
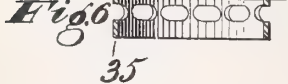


Fig 6



Witnesses
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A. L. Miller.

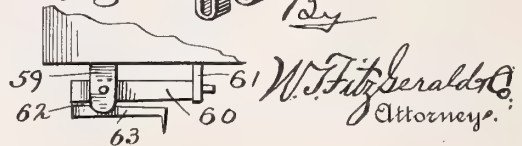
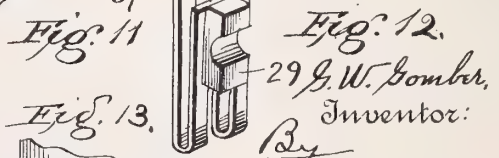
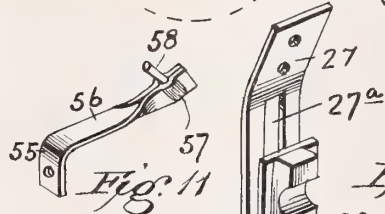
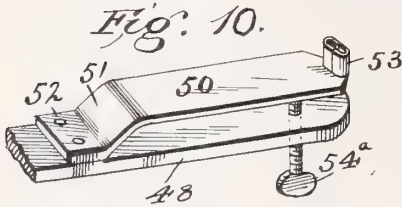
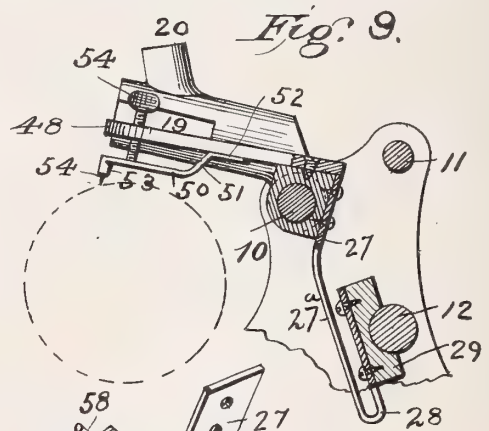
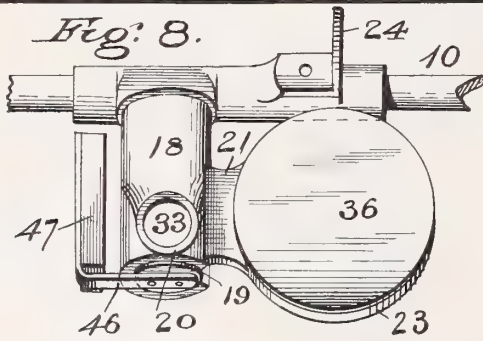
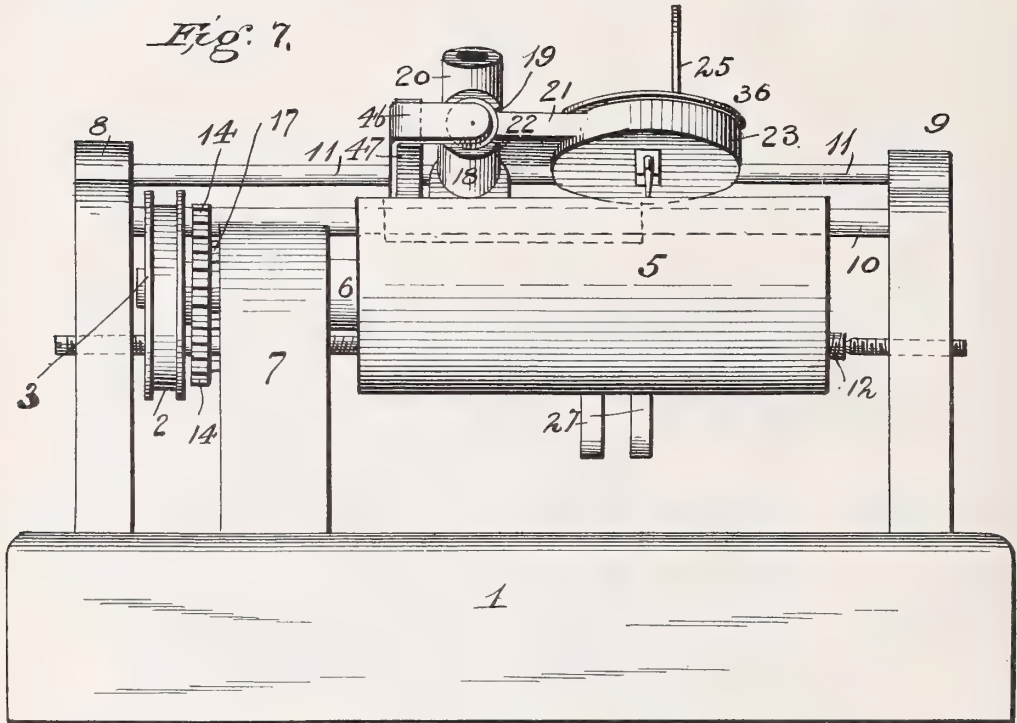
George W. Gomber, Inventor:
By
W. J. Fitzgerald & Co.
Attorneys.

G. W. GOMBER.
PHONOGRAPH.

(Application filed Apr. 8, 1897.)

(No Model.)

2 Sheets—Sheet 2.



Witnesses
F. L. Curand.
A. S. Miller

UNITED STATES PATENT OFFICE.

GEORGE W. GOMBER, OF CONYNGHAM, PENNSYLVANIA, ASSIGNOR, BY
MESNE ASSIGNMENTS, TO THE AMERICAN MULTIPLEX TALKING
MACHINE COMPANY, OF WEST VIRGINIA.

PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 659,739, dated October 16, 1900.

Application filed April 8, 1897. Serial No. 631,268. (No model.)

To all whom it may concern:

Be it known that I, GEORGE W. GOMBER, a citizen of the United States, residing at Conyngham, in the county of Luzerne and State of Pennsylvania, have invented certain new and useful Improvements in Talking-Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention has relation to talking-machines, and the advantages and details of construction thereof will be pointed out in the following specification and claims and illustrated in the accompanying drawings.

My object is to provide a machine of simple and inexpensive construction which while reliably performing the work required of a machine of the most elaborate and expensive workmanship may yet be placed upon the market at a low price.

To attain the foregoing end, it will therefore be apparent that the prime object will be to so construct and combine the various elements necessary to constitute a completely-operative talking-machine that each of said elements may be readily formed without the necessity of employing expensive machinery for such purpose, all of which will be readily apparent from the accompanying drawings, in which—

Figure 1 is a top plan view of my invention, the tablet and mandrel being shown in section. Fig. 2 is a side elevation of the carriage and parts moving therewith. Fig. 3 is a section of the tubular holder on the carriage. Fig. 4 is a top plan view of the sound-box and neck therefor. Fig. 5 is a central section of the same with its lid or cap removed. Fig. 6 is a central section of said sound-box cap. Fig. 7 is a front elevation of Fig. 1, showing a counterbalance for the sound-box body. Fig. 8 is a top plan view of the sound-box and carriage shown in Fig. 8. Fig. 9 shows a side elevation of carriage, showing sound-box removed and paring-knife in position. Fig. 10 is a detail of the paring-knife holder. Fig. 11 is a slightly-enlarged detail

of stylus-holder. Fig. 12 is a perspective detail of the nut-section and carrying-spring therefor. Fig. 13 is a side view, on an enlarged scale, of the stylus mechanism shown in Fig. 2.

The numeral 1 designates the casing, designed to reliably house the spring-actuated or other form of motor, from which motion is communicated by suitable means to the wheel 2, which is fixedly secured to one end of the mandrel-shaft 3, while to the other end of said shaft is fixedly secured the tablet-mandrel 4, carrying the tablet 5. Said shaft is adapted to rotate in a tubular bearing 6, which is securely mounted in post 7, said post being erected on the housing 1. Upon said housing are also erected standards 8 and 9, designed to form a suitable support and mounting for guide-shafts 10 and 11 and the threaded shaft 12, all of which are substantially parallel to the axis of the tablet-spindle. Guide-rod 10 forms the main guideway for the carriage 13, determining the direction of its lateral movement, while guide-rod 11 passes through cam-slot 26 of cam 25 and forms a continuous bearing (parallel to the main guide-rod 10) for the outer or longer wall of said cam-slot, and said cam having pivotal connection with the carriage 13 by means of the arm 24, fixed thereto, it follows that the position of said slot with relation to said shaft determines the plane in which the lateral movement of the carriage shall take place, so that by a proper manipulation of the cam the sound-box is lowered into or lifted out of its operative position. Fixedly secured to the shaft 3 is the gear 14, which meshes with the gear 15, which carries gear 16. Said gears 15 and 16 rotate upon an axle fixedly secured to the arm 30, which arm projects from post 7. Gear 16 meshes with gear 17, said gear 17 being fixedly secured to threaded guide-rod 12, so that motion from axle 3 is imparted thereto; but owing to the size and arrangement of said gears guide-rod 12 rotates much more slowly than the mandrel, the object of which will be pointed out hereinafter.

If found desirable, guide-rod 12 may be

held in position by center points secured in posts 8 and 9 and taking into center bores in the ends of said guide-rod adapted to form suitable bearings for said center points.

5 The carriage 13 is provided with the tubular projection 18, constituting the sound-box. Said box is provided with the lateral slot 19 and the nozzle 20. Said sound-box, with its slot 19, is adapted to receive the head and
10 neck 21 and 22, respectively, of the sound-box 23. The width of said slot is somewhat greater than the thickness of said neck, thus permitting a slight upward and downward play of the sound-box, which is necessary in
15 the performance of its work. The tubular holder 18, by means of its nozzle 20, is designed to receive and support the usual flexible tube, and owing to the support the carriage receives from guide-rod 11 through the media-
20 tion of arm 24 and cam 25 the delicate operations of the sound-box are in no way affected by the weight of the carriage or by any other weight that may be imposed thereon, (as by the mounting of flexible tubes or the
25 like.) If found desirable, the outer end of the sound-box 18 may be provided with a cap or other retaining device, (not shown,) though it is thought that the sound-box head will reliably retain its position by gravity, as the
30 outer end of the holder is inclined upward.

Fixedly secured to the carriage 13 is the arm 24, to which is pivotally secured the cam 25, having the cam-slot 26, and, as already pointed out, the position of said slot with relation to shaft 11 determines the depending
35 position of the carriage and sound-box and the plane in which they travel back and forth. It will also be observed that the carriage 13 is further provided with the slotted strap-spring 27, bent upon itself, forming the loop
40 28. This construction permits the use of a longer piece of spring metal, and thereby secures greater resiliency. Said spring is designed to carry the threaded block 29, secured
45 thereto at its free end. I prefer to provide the slot 27^a nearly the entire length of said spring to give greater resiliency and also permit the threaded block to be attached in position by screws entered from the rear
50 side thereof, as shown in Fig. 10. It will be observed that when the carriage is in such position as to bring the pivoted arm of the sound-box into contact with the tablet the nut-section is also brought into en-
55 gagement with the threaded shaft 12, and vice versa. When by a proper movement of cam 25 the stylus-point is brought into contact with the tablet and the nut-section 29 into engagement with the threaded
60 shaft 12, lateral motion will be imparted to the carriage through said nut-section 29 and spring 27 as the tablet-spindle rotates. Since threaded shaft 12, as already shown, rotates slowly, a coarser thread can be employed in
65 producing a standard or any given record than could otherwise be used.

In the neck of the sound-box is the recessed

cavity 31, which extends outwardly through the sound-box head and terminates in the flared mouth 32, while its inner end opens
70 into the inner space inclosed by the sound-box. When the sound-box is in its operative position in its receiver or holder 18, the mouth 32 of cavity 31 will register with the communicating orifice 33 of nozzle 20, so that
75 there shall be no obstruction to sounds or vibrations between the sound-box 34 and the mouth of the flexible tube communicating with orifice 33.

The depending flange 35 of lid 36 does not
80 form an obstruction to the free passage of sounds back and forth, since said flange is provided with a series of apertures disposed around its entire periphery a short distance
85 apart. If preferred, that portion of the cap contiguous to the opening in the neck may be entirely cut away. Lid 36 may be held in its proper position on the sound-box by
90 frictional contact or by a screw-threaded union, as preferred.

I will now refer to the details involved in producing other parts of a completely-operative talking-machine, the construction thereof being of the simplest character. In Figs. 7
95 and 8 I have shown a modified construction to be employed where it is deemed necessary to more reliably poise the sound-box in its operative position, and with this end in view I attach preferably to the outer end of the
100 head 23 the laterally-extending arm 46, having connection with the counterpoise 47, the latter being formed of suitable material and size and preferably disposed in a plane parallel with the holder 18. By a nice adjust-
105 ment of the parts forming the counterpoise it will be apparent that the sound-box will be held in very sensitive or light contact with the tablet, and it will be further apparent that these parts may be very cheaply constructed and assembled. 110

As it is essential to a completely-operative talking-machine that a paring device shall be provided, I have produced a device of this character of very simple and ready construction, which I have illustrated in Figs. 9 and
115 10. This paring device consists of the support or body 48, one end of which may be attached to any convenient point of the carriage, preferably at the base of the support or stand-
120 ard 24, after the sound-box has been removed from the holder 18. Said support 48 may be attached in any preferred manner and is provided upon its under side with the depending spring or knife-holder, which is of special construction and is more clearly illustrated in
125 Fig. 10. Said spring-support consists of the main section 50, the upwardly-inclined section 51, and the anchoring-section 52, which is attached to the body 48 by screws or otherwise. The free end of the main section 50 is
130 provided with the downwardly-extending integrally-formed socket 53, in which the knife 54 is seated and reliably held to its work. The socket 53, it will be observed, is readily formed

by properly cutting away and bending the free end of the section 50. In order that the position of the knife may be readily adjusted, I seat in or near the outer end of the holder or body 48 the adjusting-screw 54^a, which passes entirely through said support, the free end bearing against the upper side of the free end of the main section 50.

In Figs. 10 and 11 I have illustrated a cheap but effective means of mounting the stylus-point. By reference to Fig. 11 it will be observed that the said holder is formed from a strip of suitable material, thus providing the anchoring-section 55 for connection with the sound-box body or base and with the inwardly-reaching section 56, designed to lie substantially parallel with the lower surface of the sound-box body or support, while the free end is so bent that the edges thereof will rest alongside of each other, and it will be seen that if the point of a suitable tool or other object is placed between said edges before they are brought entirely together the socket 57 will be formed, in which the stylus-point 58 may be reliably seated and efficiently held by further closure of the edges, thus making it possible to strike the entire holding device from a single piece of material at one operation.

It is thought that the several parts constituting my improved simplified talking-machine will be found as thoroughly efficient as those of more elaborate design and construction, thus enabling me to accomplish the object specified.

The operation of the paring device, it is thought, will be clearly apparent, though it may be stated that after the device is secured in its operative position the knife may be brought into engagement with the surface of the tablet by a proper manipulation of the regulating-screw 54^a, the tension of the spring being so disposed that it will extend normally upward—that is to say, if the set-screw should force the knife too deeply into the tablet the recession of the knife will follow the withdrawal of said screw, thus producing a device of positive character.

In Fig. 13 I have illustrated in side elevation a stylus-holding device especially designed for use upon a sound-box whereon no weight is used. It will be seen that the standard 59 is erected directly upon the lower face of the body of the sound-box and is preferably bifurcated, thus providing a seat for the outer end of the pivoted lever 60 and the guides for controlling the lateral swing of the stylus-arm, the inner end of said lever reaching over the central part of the sound-box, with which it is coöperatively united by means of the usual link 61. The outer or pivoted end of the lever 60 extends slightly past the standard and is provided with a vertically-disposed aperture, in which is seated the lug or journal 62, formed upon the stylus-arm 63. It will be observed that the construction just

described is of great simplicity, rendering the device especially applicable to a sound-box pivoted in the manner specified in this application. I admit that this method of mounting the stylus-arm would be found more or less impractical upon a sound-box not provided with a weight and mounted in the manner common for mounting sound-boxes. I claim, however, great advantages for the construction, owing to the simplicity thereof, when it is used in connection with the means I have set forth for sensitively holding the sound-box body in its operative position, as the stylus-point will yieldingly follow the line of record or inscribe the same upon the tablet, as will be readily apparent.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. As an improvement in talking-machines, the combination with a sound-box carriage, of a slotted power-transmitting spring, bent back upon itself, and a nut-section secured to the free end of said spring, the screws being opposite to and accessible through the slot in the spring, substantially as set forth.

2. In talking-machines, the combination of a sound-box, a supporting-post and a tubular holder open at its free end and having a longitudinal slot into which fits the neck of the sound-box, said holder being provided with a transmitting orifice or nozzle, all arranged as set forth.

3. As an improvement in talking-machines, the combination with the sound-box carriage, of a controlling-lever pivotally mounted on said carriage and having upon its enlarged end the cam-slot 26, and a guide-rod working in said slot, substantially as described and for the purpose set forth.

4. As an improvement in talking-machines, the combination with a supporting-post and tubular bearing extending through the same, a shaft working in said bearing which extends along and supports the shaft nearly its entire length, and a mandrel secured to the shaft, substantially as set forth.

5. As an improvement in talking-machines, the combination with a sound-box carriage, of a tubular sound-box mounted thereon open at its outer end and provided laterally with a longitudinal slot cutting said open end, a sound-box provided with a hollow head and diminished neck, the axis of the head being located at one side of and in a line parallel to a tangent of the sound-box, the head fitting within the holder and the neck entering the slot thereof, and sound-transmitting opening communicating through the head and neck with the interior of the sound-box, substantially as set forth.

6. As an improvement in talking-machines, the combination with a sound-box carriage, of a tubular holder mounted thereon, a sound-box having a hollow head located to one side of and its axis in a line parallel to a tangent

of the sound-box, and a counterpoise upon the head adapted to counteract the weight of the sound-box, substantially as set forth.

7. As an improvement in talking-machines, the herein-described tablet-paring knife, consisting of the base or body; a depending spring secured thereto and having its free end so bent and shaped as to provide a socket adapted to receive and retain the cutting-blade, and means for moving the knife in or out of the path of the tablet-surface, substantially as described and for the purpose set forth.

8. As an improvement in talking-machines, the combination with a sound-box having a bifurcated post secured directly to the lower surface thereof, of a pivoted lever mounted on said post, a link connecting the lever and sound-box, said lever having an aperture in its opposite end; a stylus-carrying arm mounted in said aperture and having its lateral movement circumscribed by the bifurcated ends of said standard and further designed to carry the stylus-point, all operatively combined and arranged in the manner and for the purpose set forth.

9. In talking-machines, a sound-box hav-

ing a bifurcated standard and a depending link, a lever pivoted in said standard and connected with said link, and also having an aperture, a stylus having a lug seated in said aperture whereby the lateral swing of the stylus is controlled as set forth.

10. In phonographs, a sound-box having a head 21 and neck 22, a carriage having a slotted tubular projection, said neck fitting the slot and said head telescoping in the tubular projection, all combined as set forth.

11. In phonographs, a sound-box having a perforated flange, a carriage for said box having a nozzle and an air-passage connecting said box and nozzle, all arranged as set forth.

12. In phonographs, a sound-box carriage provided with a paring device having a spring, a knife supported by said spring and means to adjust the position of the knife, all arranged as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

GEORGE W. GOMBER.

Witnesses:

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No. 659,740.

Patented Oct. 16, 1900.

G. W. GOMBER.
TALKING MACHINE.

(Application filed May 13, 1899.)

(No Model.)

3 Sheets—Sheet 1.

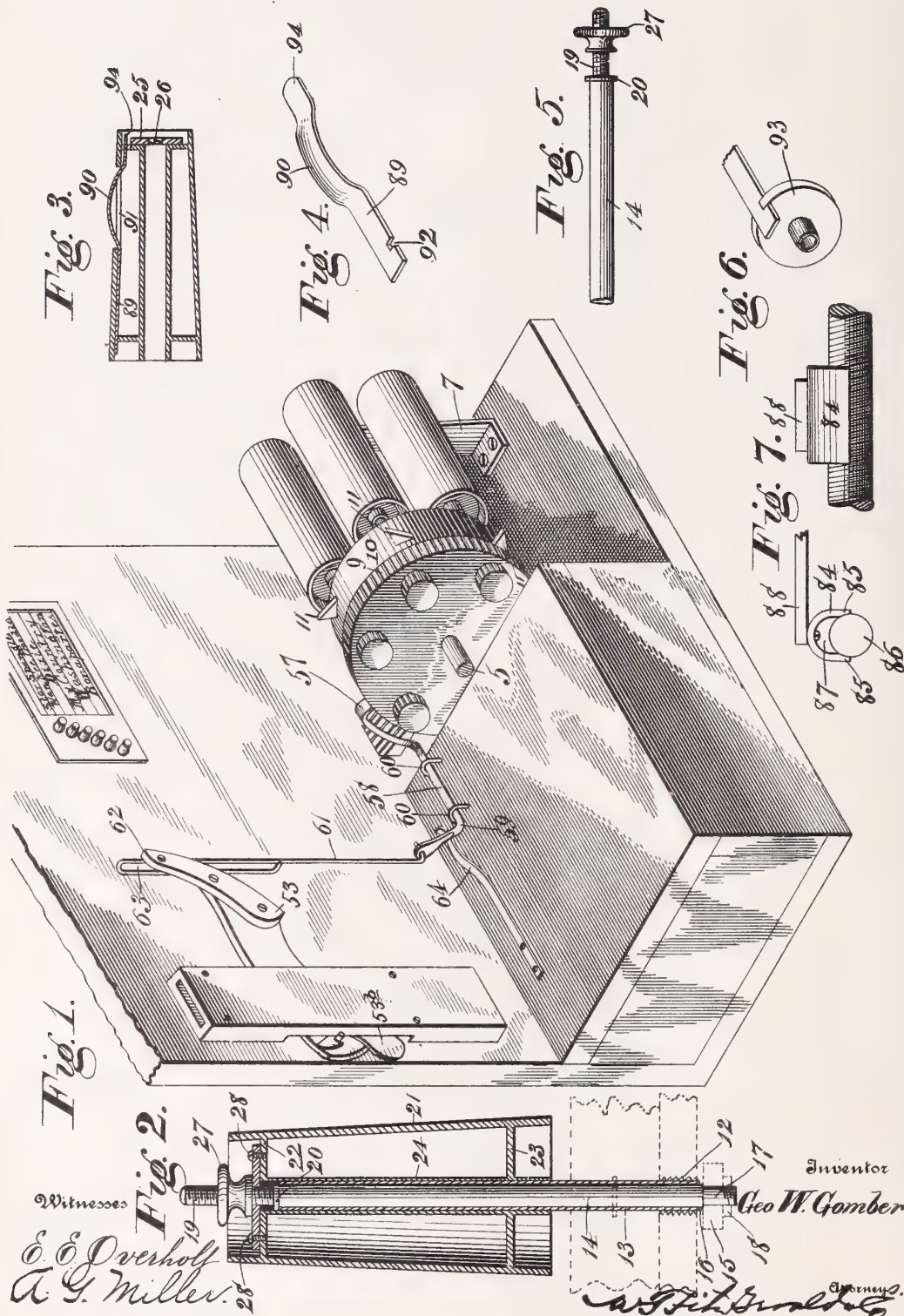


Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 5.

Fig. 6.

Fig. 7.

Fig. 8.

Witnesses

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(Application filed May 13, 1899.)

(No Model.)

3 Sheets—Sheet 2.

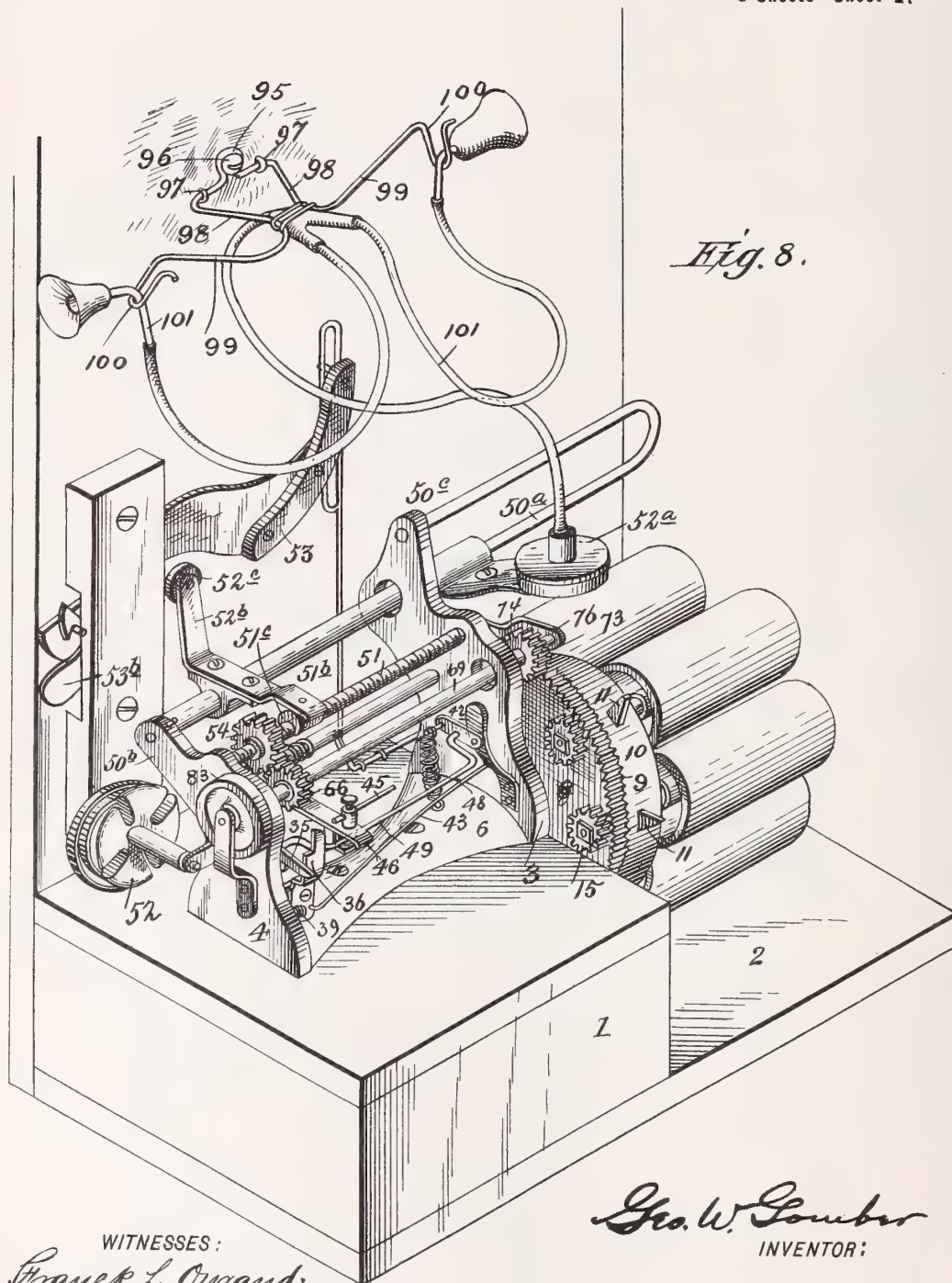


Fig. 8.

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No. 659,740.

Patented Oct. 16, 1900.

G. W. GOMBER.
TALKING MACHINE.

(Application filed May 18, 1899.)

(No Model.)

3 Sheets—Sheet 3.

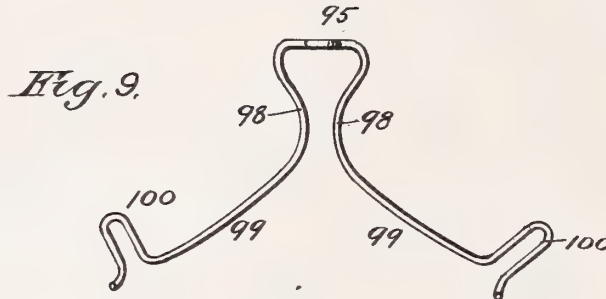
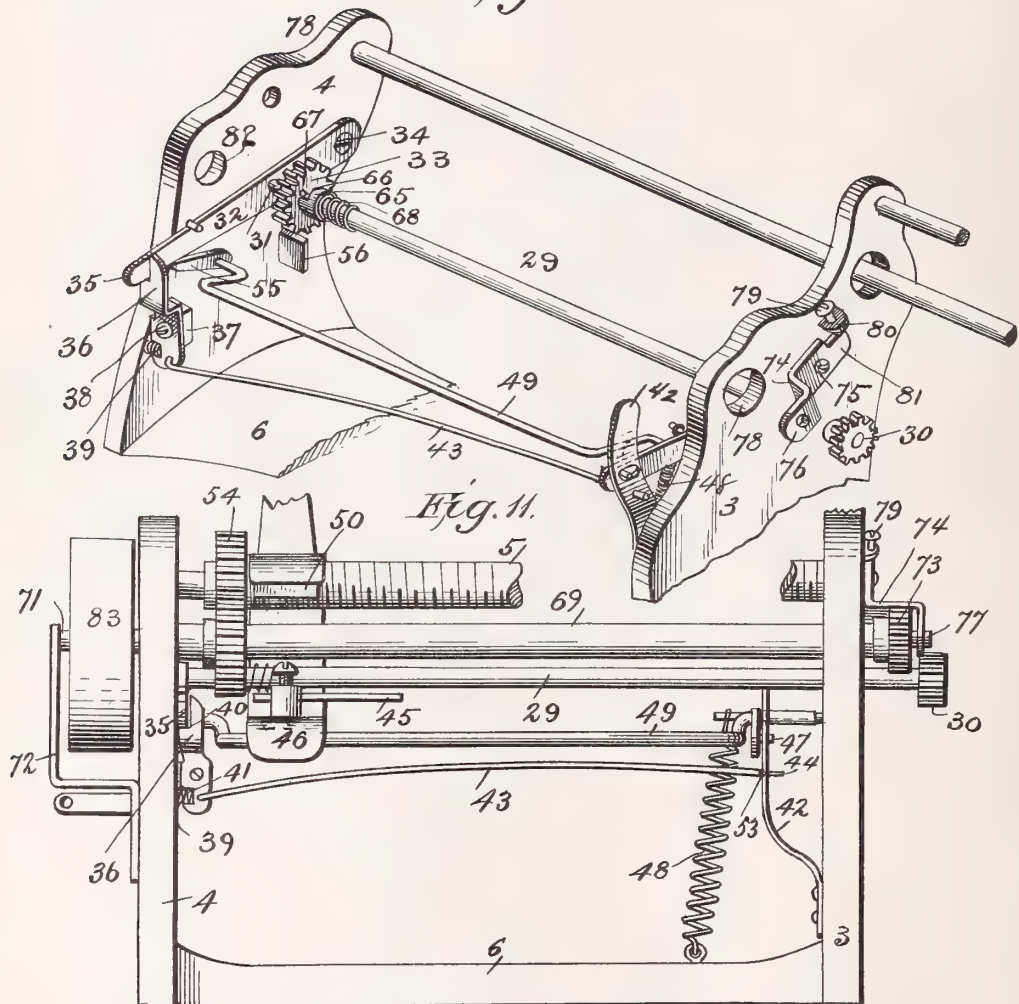


Fig. 10



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UNITED STATES PATENT OFFICE.

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TALKING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 659,740, dated October 16, 1900.

Application filed May 13, 1899. Serial No. 716,671. (No model.)

To all whom it may concern:

Be it known that I, GEORGE W. GOMBER, a citizen of the United States, residing at Conyngham, in the county of Luzerne and State of Pennsylvania, have invented certain new and useful Improvements in Talking-Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to phonographs, and more particularly to that variety thereof comprising a rotatable tablet-magazine and individual selective mechanism; and it consists in certain novel features of combination and construction of parts, the preferred materialization of which will be hereinafter fully set forth, it being understood that such substantial equivalents and modifications as fairly fall within the scope of my invention are comprehended by me.

The object, therefore, among others, of my present invention is to simplify some of my previous work which has been fully set forth in several applications which I have heretofore filed in the United States Patent Office.

As I shall hereinafter specifically point out the simplified parts of my invention, I deem it unnecessary to enter elaborately into a description of all the essential elements of a phonograph or talking-machine and will therefore confine the present application both in respect to the drawings and the specification to a showing which will make clear my present ideas regarding a simplified form of manifestation for what I regard the essential features of my work. In applications heretofore filed by me will be found many parts which are in my present case wholly eliminated or substituted by a much simpler form of mechanical expression. I refer particularly to means for locking the tablet-magazine at the instant the selected tablet has been brought into coöperation with the diaphragm, and, further, to means for permitting the driving-gear for the tablet to at first move out of the way of the individual tablet-gears and afterward drop instantly into mesh with one of said gears when the latter

has been brought into an adjusted position for coöperation with the stylus.

A further object of this invention is to provide means for effecting the longitudinal adjustment of the mandrel and the tablet carried thereon, that the stylus will at once find the line of record without the necessity of first traveling over the usual blank end of the tablet.

Further objects and advantages will be made fully apparent from the accompanying drawings, in which—

Figure 1 is a perspective view of the tablet-magazine and a portion of the framework, illustrating a locking detent or pawl designed to hold the magazine in an adjusted position. Fig. 2 is a longitudinal central section of a mandrel, illustrating the means I employ to adjust the same longitudinally upon its supporting-shaft. Fig. 3 is a central section of the mandrel removed from its supporting-shaft. Fig. 4 is a perspective view of the spring employed to hold the tablet in position upon its mandrel. Fig. 5 is a side view of the supporting-spindle upon which the mandrel rotates. Fig. 6 is a detail view illustrating the preferred means for holding the tablet-securing spring in place. Fig. 7 illustrates an end view and a side elevation of the means I employ to detachably connect the driving-arm of the carriage to the threaded shaft. Fig. 8 is a perspective view of my talking-machine complete. Fig. 9 is a detail view of the supporting-rack designed to hold the tubes while not in use. Fig. 10 is a perspective view of the standards employed to support the several parts of my driving mechanism and diaphragm-carriage, the main portion of said parts being removed. Fig. 11 is a front view of the driving mechanism between the standards as illustrated in Fig. 8.

In order to conveniently refer to the several details of my invention and their coöperating accessories, numerals will be employed, of which 1 is the supporting-base, which may be constructed in any preferred way and is designed to provide a housing for the electric or other form of motor employed to drive the mechanism.

Upon the base portion 1, which also com-

prises the extension or subbase 2, I mount the standards 3 and 4, which are designed to support the mechanism employed to actuate the carriage and the tablet-magazine, which latter is supported upon a suitable shaft 5, properly secured in position by means of the standard 3 and the base-section 6, the outer end of said shaft being supported in suitable bearings carried by the standard 7, properly mounted in position upon the extension 2. Upon the shaft or axle 5 thus provided I fixedly secure, so that it will rotate with said shaft, the driving head or disk 8, the peripheral face of which is provided with the teeth 9, and fixedly secured to said disk or head or integrally formed therewith is the outwardly-directed flange or collar 10, the peripheral face of which is designed to carry a series of graduated or disalined stops or lugs 11, or said stops may be replaced by a series of disalined or graduated slots, as I have fully explained in a previous application.

It will be understood that the disk or head 8 may be made of any preferred diameter as may be necessary to accommodate eight, ten, twelve, or more mandrels, and in order that the spindles may be properly supported in their operative positions I provide at equidistant points near the edge of said head suitably-threaded apertures designed to receive the threaded end 12 of the tablet-supporting sleeve 13, as it is by this means that I am enabled to rigidly secure said sleeve in position, and thereby provide reliably-efficient means to support and sustain the outer or free end of said sleeve and the mandrel carried thereon without the necessity of a special support or standard for said end, a valuable desideratum, inasmuch as it has been common heretofore to individually support the tablets by means of bearing-points carried upon an auxiliary or outer head.

In order to afford an adjustability for the mandrel, to the end that said spindle may be moved longitudinally and then firmly though rotatably secured in place, I provide the driving-shaft 14, which is designed to be snugly received by the sleeve 13, while the extreme inner end of said shaft is designed to extend sufficiently beyond the inner face of the head 8 to afford a seat for the individual tablet-gear 15, a shoulder 16 being formed upon said shaft as it emerges past the face of the head 8, thereby providing the reduced portion 17, upon which said gear is firmly secured in place by means of the nut 18. By this construction it is obvious that the shaft 14 is left free to turn within the sleeve 13, though it is firmly supported by said sleeve. It will be observed that the opposite or outer end 19 of the shaft 14 is threaded from the point where it leaves said sleeve, and in order to prevent an inward movement of the shaft I prefer to form the fixed or integral collar or annular rib 20 thereon, which may extend outward sufficiently to coincide with the peripheral face of said sleeve. The sleeve

and shaft thus mounted in position are ready to receive the mandrel 21, which may be made substantially of the usual or any preferred construction and may be very cheaply made of some light rigid material, as paper, though it is interiorly provided at each end with the disks 22 and 23 and with the longitudinally-disposed core 24, which is provided with a bore of proper diameter to snugly receive the sleeve 13, thereby permitting said core to rotate freely upon said sleeve, and in order to adjust said core and sleeve telescopically or longitudinally with respect to each other I provide the end plate 25, which may be permanently secured to the outer face of the disk 22 in any preferred way, though best results will follow when said plate is yieldingly secured in place in order that compensation may be made for inaccuracies of construction in centering the threaded aperture 26, designed to receive the threaded end 19.

By providing that the inner end and main portion of the core 24 shall be supported by the sleeve 13 it is obvious that the extreme outer end of the mandrel is supported by the plate 25 and the threaded end 19 of the spindle. Inasmuch as the threaded aperture 26 is designed to cooperate with the threaded end 19, it is clear that the mandrel may be readily adjusted longitudinally upon the sleeve 13 by simply rotating the mandrel in the proper direction, thus throwing the mandrel close against or toward the free edge of the flange 10, or said mandrel may be reversely rotated and disposed as far as desired away from said flange, it being understood that the plate 25 may be readily secured in an adjusted position by means of the locking or jam nut 27, which is designed as a follower for said plate. If the plate 25 is yieldingly or loosely secured in place upon the disk 22, as by means of the screws 28, it will insure that the mandrel will be truly rotated, since there will be no tendency to throw the inner end of the tablet out of place by the action of the jam-nut against the plate 25.

Referring now to another feature of my invention to which I desire to call special attention, it will be observed by reference to Fig. 10 that the shaft 29, which is employed to rotate the tablet-magazine by means of the gear 30, is mounted at its inner end in suitable bearings in the standard 3, said bearings being of proper character to permit a slight downward movement of the outer end of said shaft, said outer end being seated in suitable bearings 31, carried by the lever 32. The lever 32 is designed to impart a slight upward-and-downward movability to the outer end of the shaft 29 and the gear 33 fixedly mounted thereon, as it will be observed that the inner end of said lever is pivotally secured in place upon the inner face of the standard 4 by means of the screw or lug 34, while the outer free end 35 of said lever is supported in its adjusted position by means of the movable standard

36, which is pivotally secured in position upon the bracket 37 by means of the bolt or rivet 38, the upper end of said movable standard being disposed normally outward by means of the spring 39.

By reference to Fig. 11 it will be observed that upon the outer edge of the movable standard 36 are formed the upper and lower notches or shoulders 40 and 41, respectively, the office of the former being to support the outer free end 35 of the lever while it is in an elevated position, the notch 41 being designed to afford a seat for the spring 39, and in order to provide means for actuating the movable standard 36 I connect the lower end thereof with the locking-spring 42 by means of the rod 43, the inner end 44 of which is reduced and is designed to be loosely received by an aperture provided in the spring 42 in order to afford requisite play between said parts during the recession or inward movement of the spring 42 caused by the adjustable finger 45 upon the arm of the carriage, which has been fully described in a previous application and which I deem unnecessary to herein specifically refer to. It may be stated, however, that when the arm 46 of the carriage has moved sufficiently to the right to bring the adjustable finger 45 into engagement with the spring 42 said spring will be moved toward the standard 3, and thereby release the lug 47 from its loosely-fitting aperture in said spring, and will thereby permit the spring 48 to elevate the cam-shaft 49 and incidentally raise the arm 46 of the carriage, so that the threaded block 50 will be elevated or lifted out of engagement with the threaded shaft 51, and thus place the carriage in position to be brought back to the initial or starting point by means of the governor and spring 52, the office of which has been set forth in a previous application. The reduced end 44 is provided in order that said end may play loosely in its aperture provided in the spring 42 during the inward movement of said spring, which movement must be sufficient to release the lug 47 and leave the free end thereof bearing directly against the face of the spring. By the recession of the spring 42 from the shoulder 53 the spring 39 is left free to act, which will instantly cause the upper end of the movable standard 36 to move into the path of the end 35 of the lever, and thereby bring the shoulder 40 in position to receive said lever, and thus hold the outer end of the shaft 29 and the gear 33 upward in engagement with the gear 54, fixedly secured to the threaded shaft 51, thereby imparting power to the shaft 29 for the purpose of rotating the tablet-magazine.

In order to insure that the free end of the lever 32 will be raised at the instant the carriage-arm 46 is elevated by the cam 49, I fixedly secure to said shaft immediately below the free end 35 of said lever the finger 55, which is clearly shown in Fig. 10. It will at once be appreciated that when the tablet-magazine has been sufficiently rotated to

bring the selected tablet into coöperation with the diaphragm said magazine must be instantly checked against further movement and positively and firmly held until the selection has been given off, and with this object in view I secure to the inner face of the standard 4, at a point immediately below the gear 33, the fixed detent or tooth 56, the office of which is to take between two of the teeth of said gear at the instant the free end of the lever has been lowered by the downward action of the arm 46 upon the cam-shaft 49. It is therefore clear that the detent 56 will act instantly upon the gear 33 and hold the same against any further movement and will as quickly check the impetus of the tablet-magazine, and thus insure that the stylus will drop at once into the line of record.

In Fig. 1 I have illustrated in perspective another means which may be employed to instantly check the impetus of the magazine, and thereby at once prevent further movement thereof, which consists of the detent or pawl 57, preferably integrally formed with the crank-shaft 58, having the crank-terminal 59, said crank-shaft being properly held in position, as by the loops or staples 60. The free end of the crank 59 is pivotally connected by means of the rod or link 61 to the free end of the weighted coin-controlled lever 62, as by means of the slotted section 63 of said link.

In order to more clearly illustrate how the driving mechanism is designed to actuate the diaphragm-carriage and contiguous parts, I will briefly describe said carriage, as follows: A track 50^a is properly mounted at one end in the extension or bracket 50^b, while the opposite end of said track is bent upon itself and the free end thereof rigidly secured in the extension or bracket 50^c, while designed to loosely reciprocate upon the track 50^a is the barrel or body portion 51^a. Upon one end of the barrel 51^a I secure the actuating-arm 51^b, to which I secure the threaded block 51^c, designed to engage the threaded shaft 51 and be driven thereby. The arm 46 is also attached to the barrel 51^a, and therefore moves with the arm 51^b. Upon the opposite end of the barrel 51^a I attach in any preferred way the diaphragm 52^a, and it is obvious that as said barrel is moved through the engagement of the threaded block 51^c with the threaded shaft 51 the diaphragm will be moved over the line of record, and, furthermore, that when the diaphragm has thus been moved entirely over the line of record the finger 45 will release the cam-shaft 49 and permit said shaft through the action of its controlling-spring to elevate the arms 46 and 51 and permit the carriage to be drawn backward to the initial point, and as said carriage is thus moved backward to the starting-point the arm 52^b, carrying the antifricition-roller 52^c, will cause said roller to engage the curved lower face of the weight 53^a and elevate said weight sufficiently to set the coin-trigger 53^b in position ready for the next coin.

It will be observed that the crank-shaft and detent are so constructed that when the carriage moves back to the initial point and the arm on said carriage raises the coin-controlled lever 62 it will incidentally draw upon the link 61 and raise the crank 59, and thereby throw the detent 57 into engagement with the gears or teeth 9.

In order to hold the crank-section 59 normally upward, and thereby insure that the detent 57 will be held to its work, I provide the spring 64, as clearly shown. While I have illustrated that the magazine may be thus held by the detent 57 against further rotation at the instant the selected tablet has been brought into coöperation with the diaphragm, it will be understood that the preferred means to be adopted in thus checking further rotation of the magazine and holding it until the selection has been given off consists of the pivoted lever 32 and the fixed detent 56.

The gear 33 may be keyed fixedly and directly to the shaft 29, and no resultant jar will follow when the said gear has been raised into mesh with the gear 54; but if it is thought desirable to provide against an undue impact or jar as a result of bringing the said gears suddenly into mesh with each other, as by elevating the free end 35 of the lever 32, the means which I have illustrated in Fig. 10 may be adopted, wherein it will be seen that the gear 33 is provided with an integral sleeve 65, having the radial slot 66, said sleeve being loosely secured upon the shaft 29 and caused to rotate therewith by the wrist-pin 67, which is adapted to work freely in the slot 66. In order that the blow or sudden jar incident to throwing the gears 33 and 54 into mesh with each other may be absorbed, I so mount the gear 33 upon the shaft 29 that the strain will be thrown upon the coil-spring 68, one end of which is secured to the shaft 29, while the other end is attached to the sleeve 65, it being understood that the tension of the spring shall be so adjusted as to receive the initial blow incident to the gears coming into mesh with each other, thus causing the pin 67 to move toward the other end of the slot in which it works.

By reference to Fig. 11 it will be observed that the shaft 69 (which is employed to rotate the individual tablets and is therefore designed to mesh with the individual-tablet gears 15) is supported at its inner end 71 by means of the bracket 72, which is secured in any preferred way to the standard 4, while the inner end, upon which is fixedly secured the gear 73, designed to mesh with the individual-tablet gears 15, is held in position by the pivotally-mounted adjustable bracket 74, which, as will be seen by reference to Fig. 10, is secured to the upper face of the standard 3 by means of the bolt or screw 75, the free end 76 of the bracket being designed to receive the reduced end 77 of the shaft 69. In order, therefore, to permit the gear 73 to

move out of the path of the individual gear 15 as the magazine is rotated for the purpose of bringing the selected tablet under the diaphragm, I provide in the standard 3 an enlarged aperture 78, through which the shaft 69 loosely extends, and in order to prevent the end of the shaft from dropping into contact with the standard 3 I adjust the bracket 74 in a true position by means of the set-screw 79, which is held in position by the bracket 80, attached to the inner face of the standard 3 at a contiguous point, it being readily understood that the free end of the set-screw 79 may be brought into contact with the free end 81 of the bracket 74, and thereby depress said end and correspondingly elevate the opposite end. The aperture 82, provided in the standard 4 for the reception of the outer end of the shaft 69, is also of larger size than said shaft, thus insuring that said shaft will not contact with said standard, but that the entire weight of the outer end of the shaft shall rest in its bearings carried by the bracket 72, and inasmuch as the driving-band leading from the motor is passed over the pulley 83 it is obvious that said band and the strain brought to bear thereon incident to the operation of the motor will have a tendency to pull downward upon the shaft 69 and, being entirely out of contact with the standards 3 and 4, will be forced downward at its inner end, thereby tending to hold the gear 73 tightly in mesh with the individual-tablet gear 15, and thus prevent casual play of said shaft and the consequent slipping of the gears 15 and 73, of mesh. By suspending the free end 77 of the shaft 69 by means of the pivoted bracket 74 said gear 73, however, is permitted to rise upward out of contact with the individual-tablet gear 15 during the rotation of the magazine.

It will be seen that the bracket 74 may be very nicely adjusted in position by means of the set-screw 76 and that no spring is necessary to hold the gear 73 downward, inasmuch as the force brought to bear upon the pulley 83, owing to the peculiar mounting of the shaft 69, is amply sufficient to hold said gear to its work and yet permit said gear to rise out of the way of the gears 15 as they successively pass it.

I desire to call special attention to the means which I employ to connect the carriage to the threaded shaft, which means is fully illustrated in Fig. 7, wherein it will be observed that in lieu of the usual threaded half or mutilated nut I have provided the U-shaped body-section 84, which is of sufficient extent that the inner edges only of the depending ends 85 may be threaded, in order to coöperate with the threaded face of the shaft 86, the depending ends 85 being sufficiently separated to receive only the upper portion of said shaft, the threaded faces of the depending ends contacting with the peripheral face of the shaft above the median line thereof. By thus disposing the depend-

ing ends 85 with respect to the shaft compensation is made for wear, inasmuch as the said faces will readily adjust themselves to fit the shaft, it being understood that there is an opening or clearance above the shaft, as indicated by the numeral 87. I so mount the body-section 84 upon the arm 88 of the diaphragm-carriage that it will have an endwise play thereon sufficient to enable said body-section to readily accommodate itself as a connecting-link between the arm of the carriage and the threaded shaft, even though said shaft and said arm be not adjusted with absolute accuracy. It will be readily appreciated that if the ordinary threaded block were rigidly secured to the arm and if the threaded shaft were not truly alined so that it would lie parallel with the plane of the path traveled by said block there would be a tendency to bind or twist, with the result that the carriage would be subject to more or less jar and that the threads of either the block or the shaft, or both, would be liable to injury. By means of the internally-threaded U-shaped body-section 87 I am enabled to reduce the contacting surface of the block and shaft to a minimum, and by movably securing the block to the arm of the carriage said block is free to adjust itself to any inequalities or imperfections of construction and mounting of said parts, and it is thought that the result will be very advantageous, inasmuch as much less power will be required to drive the carriage, owing to the elimination of all pinching and binding of the parts.

By reference to Fig. 7 it will be observed that two rivets or screws are employed to hold the U-shaped section 84 in place, it being understood that loosely-fitting apertures are to be provided in said section for the reception of said screws or rivets in order to give the requisite lateral movement or play.

In order that the tablet may be held upon the mandrel without the necessity of forcing the tablet tightly home upon the tapered surface of the mandrel, and, further, to prevent the tablet from becoming broken by reason of the expansion of the mandrel or the contraction of the tablet, I provide the retaining-spring 89, having the outwardly-curved section 90, which portion is adapted to extend through the slot 91, provided in the mandrel, near the middle portion thereof.

By reference to Fig. 3 it will be observed that the curved portion 90 extends beyond the peripheral face of the mandrel and is designed to come directly in contact with the inner face of the tablet, and thereby bind against the same and secure it in an adjusted position.

In order to adjust the retaining-spring in place, and thereby avoid the necessity of riveting the same to contiguous parts of the frame near the inner end of said spring, a notch or recess 92, of sufficient width to exactly receive the edge of the disk 93, is provided, it being understood that a notch or

recess is cut in the peripheral face of said disk of a width or extent coinciding with the width of the retaining-spring after the recess 92 has been formed, the recess 92 being adapted to receive a portion of the disk, and thereby prevent the spring from having a longitudinal movement. The free end 94 of the spring may be grasped, as by the nail of the operator, and moved inward sufficiently to release the binding action caused by the curved section 90, and thereby permit the tablet to be freely withdrawn from its adjusted position and readily replaced by simply slipping the succeeding tablet over it.

To afford a desirable and attractive means by which the tubes leading to the diaphragm may be disposed when not in use, I deem it desirable to provide a supporting-rack which will be neat and attractive in appearance and thoroughly efficient in the performance of its office and which may be produced at a minimum cost, and with this end in view I secure to the upper portion of the machine, at any desired point thereon, my improved supporting-rack, which in this instance is formed of a single piece of wire, so bent near its middle as to provide the anchoring or loop section 95, designed to receive the anchoring bolt or screw 96, by means of which and the staples 47 my rack is held in an adjusted position. After the loop-section 95 has been provided I provide the lateral branches designed to pass through the staples 47, and then form the outwardly-extending sections 98, having the lateral branches 99, upon the extreme ends of which are formed the hook sections or supports 100, by means of which the tubes 101 are held in an adjusted position when not in use. It is thought that the provision of this form of supporting-rack for the tubes will render the machine much more attractive in appearance and that the tubes will be more conveniently accessible than if left to hang downward in the usual manner, and while I have shown the preferred form of rack which may be employed it will be understood that the substantial equivalent thereof is comprehended by me, inasmuch as various modifications may be made thereof.

What I claim is—

1. In a talking-machine, the combination with a frame, tablet-magazine adapted to carry tablets, a diaphragm-carriage and carriage-driving mechanism, of a shaft connected with the magazine and with the carriage-driving mechanism, respectively, and means for making and breaking the connection with the carriage-driving mechanism at predetermined intervals, substantially as set forth.

2. In a talking-machine, the combination with a frame, tablet-magazine adapted to carry tablets, a shaft operatively connected at one end with the tablet-magazine, and a lever movably supporting it at the other end, tablet-magazine-driving mechanism, a diaphragm-carriage and diaphragm-carriage-driving mechanism, of means upon the shaft adapted

to connect and disconnect the two driving mechanisms, and means for operating the lever, substantially as set forth.

3. In a talking-machine, the combination
5 with a frame, tablet-magazine adapted to carry tablets, a shaft operatively connected at one end with the tablet-magazine, and a lever movably supporting it at the other end, tablet-magazine-driving mechanism, a diaphragm-carriage, and diaphragm-carriage-driving
10 mechanism, of means upon the shaft adapted to connect and disconnect the two driving mechanisms, and means for automatically operating the lever to render the magazine intermittently operative, substantially as set
15 forth.

4. In a talking-machine, the combination with a frame, tablet-magazine adapted to carry tablets, driving mechanism for the magazine
20 including a shaft loosely journaled at one end and yieldingly supported at the other end, actuating mechanism for the diaphragm-carriage, of means on said shaft adapted to connect and disconnect the actuating and the
25 driving mechanism, as set forth.

5. In a talking-machine, tablet-magazine and driving mechanism therefor including a shaft having a pinion, a pivoted lever in which the shaft is journaled at one end and means
30 to elevate the free end of the lever, all arranged as set forth.

6. In a talking-machine, a tablet-magazine, a shaft having a pinion and supporting said magazine, driving mechanism therefor including a swinging shaft having a pinion and
35 means to elevate said swinging shaft, all arranged as set forth.

7. In a talking-machine, a shaft, a tablet having a slot supported on said shaft, said
40 tablet having a recessed disk, a retaining-spring having one end fitted into said recess and a curved section extending through said slot, as set forth.

8. In a talking-machine, means to operate
45 the machine including a driving-shaft pro-

vided with a pinion, a lever in which one end of said shaft is journaled and a device to operate the free end of said lever whereby the pinion may be elevated or depressed, all combined substantially as set forth.

9. In a talking-machine, means to operate the machine including a driving-shaft provided with a pinion, a lever in which one end of said shaft is journaled, a threaded shaft
55 provided with a pinion and operating the diaphragm-carriage and means to operate the free end of the lever whereby the pinion on the driving-shaft is thrown into and out of gear with the pinion on the threaded shaft, all combined as set forth.

10. In a talking-machine, tablet-magazines, a shaft rotating the same and pivoted at one end in an adjustable lever having a free outer end, a movable standard supporting
60 said free end and a spring pressing the standard in an outward direction, all combined as set forth.

11. In a talking-machine, a driving-screw carrying a carriage having an arm cooperating with a crank-shaft, a spring 42 and a lug
70 47 locking said shaft in position, a device carried by the carriage to release the lug and means to elevate the cam-shaft and thereby disengage the carriage from the driving-screw, all combined as set forth.

12. In a talking-machine, a driving-disk carrying tablet-magazines and further provided with teeth, a driving-shaft having a gear adapted to engage said teeth, and also
80 having a radially-slotted sleeve loosely secured on said shaft and rotating therewith, and a spring secured to the shaft and sleeve whereby the jar will be absorbed on the starting of the machine, all combined as set forth.

In testimony whereof I affix my signature
85 in presence of two witnesses.

GEORGE W. GOMBER.

Witnesses:

EMMA M. GILLET,
W. T. FITZGERALD.

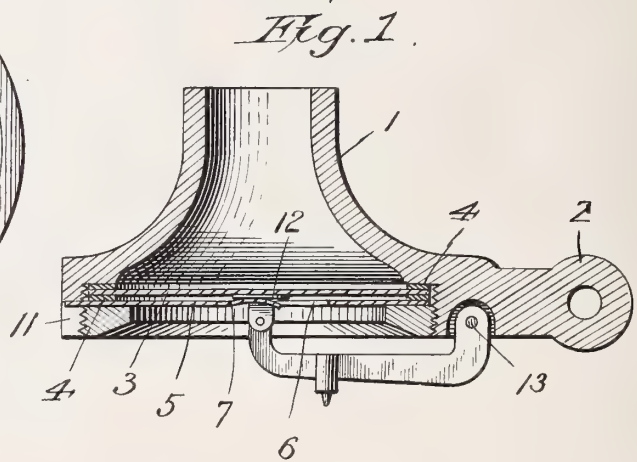
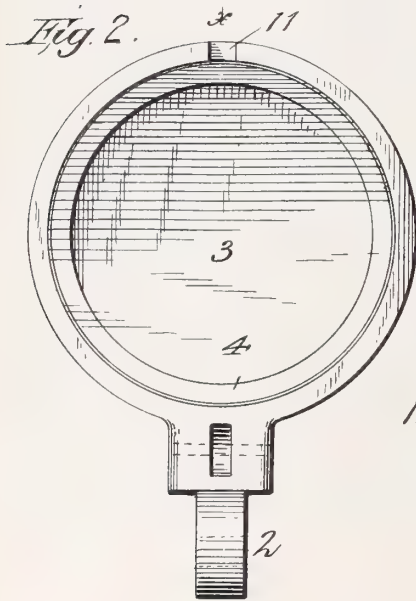
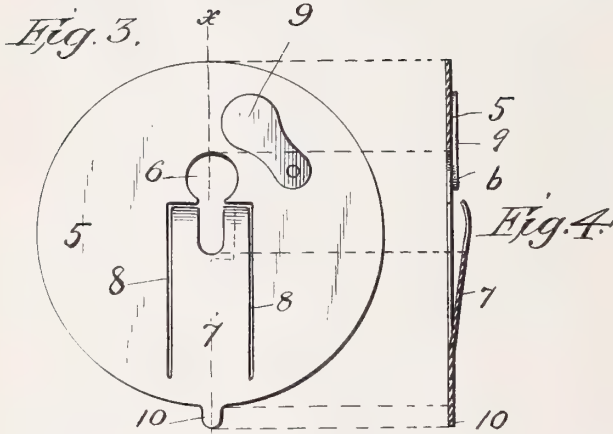
No. 660,275.

Patented Oct. 23, 1900.

F. MYERS.
PHONOGRAPH SOUND BOX.

(Application filed Mar. 22, 1900.)

(No Model.)



WITNESSES:

F. L. Giraud.
James H. Jones

INVENTOR:

Frederick Myers.

BY

E. P. Bunnell
his ATTORNEY.

UNITED STATES PATENT OFFICE

FREDERICK MYERS, OF NEW YORK, N. Y., ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, TO THE STYLOPHONE COMPANY, OF SAME PLACE.

PHONOGRAPH SOUND-BOX.

SPECIFICATION forming part of Letters Patent No. 660,275, dated October 23, 1900.

Application filed March 22, 1900. Serial No. 9,758. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK MYERS, a citizen of the United States, residing at New York city, in the county of New York and State of New York, have invented certain new and useful Improvements in Sound-Boxes for Phonographs; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the figures of reference marked thereon, which form a part of this specification.

My invention relates to sound-boxes for phonographs; and the objects of the same are to provide means for giving the proper tension to the diaphragm to compensate for climatic changes, to regulate the intensity to any degree necessary, and to give accuracy to the inflections and articulations of vocal productions.

Another object is to provide simple and efficient means for regulating and adjusting the diaphragm to increase the amplitude, to improve the quality of reproduction, and to improve the sensitive qualities to give a more perfect imitation of the human voice.

These objects are attained by means of the construction shown in the accompanying drawings, which form a part of this specification, and in which—

Figure 1 is a longitudinal section of a sound-box provided with a metal disk for holding the pivoted lug on the end of the stylus-lever in constant contact with the diaphragm. Fig. 2 is an under side plan view of the sound-box with the metal disk and stylus-lever removed. Fig. 3 is a plan view of the metal disk. Fig. 4 is a sectional view of the same on line *x x*, Fig. 3.

Like numerals of reference designate like parts in the different views.

In said drawings the numeral 1 designates a sound-box, which may be of any suitable construction and is provided with a diaphragm 3, which may be made of any suitable material, but is preferably of fibrous board or paper-stock. A gasket 4 is placed upon each side of the diaphragm, and resting upon the outer gasket is a thin sheet-metal disk 5. This disk

has a keyhole-slot 6 formed therein, and a spring-tongue 7 is formed from the disk by the slits 8. The end of the spring-tongue is bifurcated by the smaller portion of the keyhole-slot 6. This spring-tongue is bent slightly inward from the disk, as shown in Fig. 4. A guard or cover 9 is pivoted to the disk 5 to cover the larger portion of the keyhole-slot 6. Instead of the cover 9 I may, however, use a disk of ordinary paper, which may be slitted and secured by paste or cement to the outer surface of the disk to prevent the sound from dissipation or dissemination outward from the sound-box. A lug 10, formed on the edge of the disk 5, fits into a recess 11 in the rim of the sound-box. The sounder 12 is held up against the diaphragm by the bifurcated end of the spring-tongue 7. When the diaphragm and the disk 5 are secured in the sound-box by the threaded rim fitting the screw-threads in the sound-box or in any suitable manner, the enlarged end of the sounder 12 may be passed through the enlarged portion of the keyhole-slot in the disk and moved under the spring-tongue between the bifurcated ends thereof, the pivot-pin 13 being first removed. The spring-tongue holds the sounder up into contact with the diaphragm with a gentle pressure, which pressure, however, may be regulated by bending the spring-tongue 7 more or less, as required. The thin metal disk 5 prevents deflection or outward dissipation of the sound-waves, and owing to the spring-pressure of the tongue 7 the sounder does not require to be secured by glue or otherwise to the diaphragm. This construction has been found very efficient in giving amplitude, superior quality of reproduction, and great sensitive-

By means of the spring-tongue 7 the tension of the diaphragm is adjusted to regulate the intensity to any degree necessary and to compensate for changes in climate.

Without desiring to be limited to the exact construction shown, as I am aware that many changes may be made in the details of construction without departing from the spirit and scope of my invention, what I claim is—

1. A sound-box for sound-producing instruments, comprising a hollow box, a diaphragm therein, a thin metal disk held in a plane par-

allel to the diaphragm, a bifurcated spring-tongue integral with the disk, a sounder held in contact with the diaphragm by the spring-tongue, and a cover on the disk.

5 2. A diaphragm, comprising a disk of flexible material, a thin metal disk secured parallel to the diaphragm, an aperture in the metal disk, a spring-tongue formed on the disk, said spring-tongue being bifurcated at
10 its free end, a sounder held in contact with

the diaphragm by the spring-tongue, and means for holding the diaphragm and metal disk in a sound-box.

In testimony whereof I affix my signature in presence of two witnesses.

FREDERICK MYERS.

Witnesses:

SAML. A. DRURY,

E. F. CAVERLY.



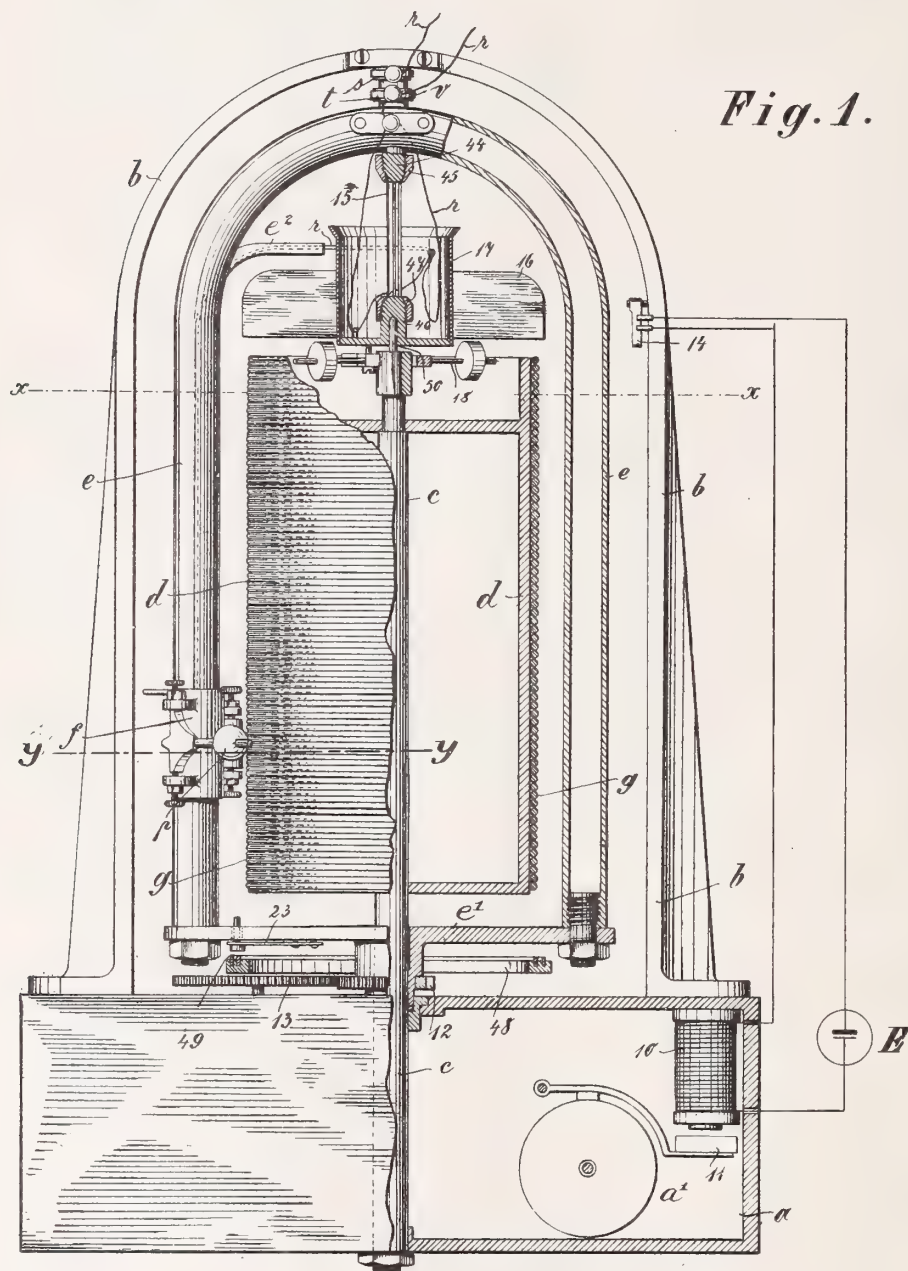
Patented Nov. 13, 1900.

METHOD OF RECORDING AND REPRODUCING SOUNDS OR SIGNALS.

(Application filed July 8, 1899.)

(No Model.)

3 Sheets—Sheet 1



Witnesses:
Frank J. Ober
Waldo M. Chapin

Inventor:
Valdemar Poulsen.
by Wm. A. Rasmussen Att'y



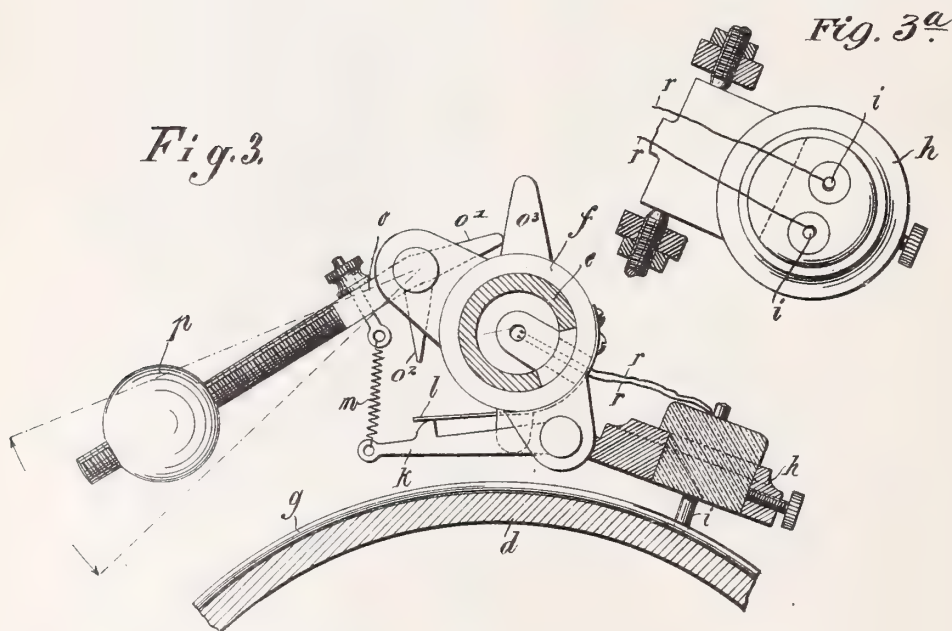
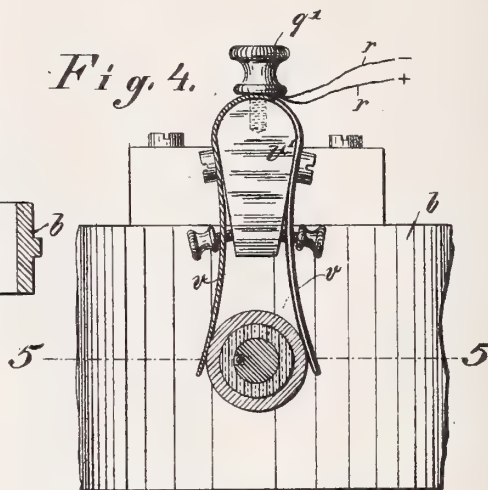
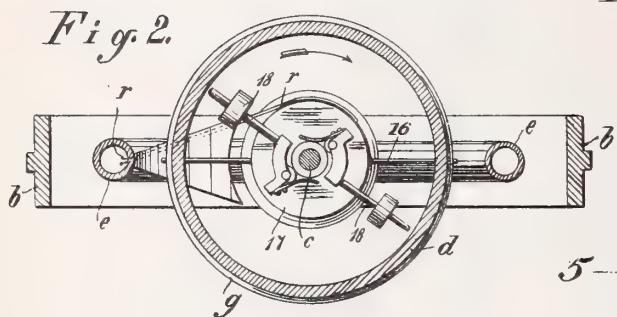
V. POULSEN.

METHOD OF RECORDING AND REPRODUCING SOUNDS OR SIGNALS.

(Application filed July 8, 1899.)

(No Model.)

3 Sheets—Sheet 2.



Witnesses:
Frank S. Ober
Waldo M. Schapin

Inventor:
Valdemar Poulsen,
 by *Wm. A. Rasmussen*
Att'y,



No. 661,619.

Patented Nov. 13, 1900.

V. POULSEN.

METHOD OF RECORDING AND REPRODUCING SOUNDS OR SIGNALS.

(Application filed July 8, 1899.)

(No Model.)

3 Sheets—Sheet 3.

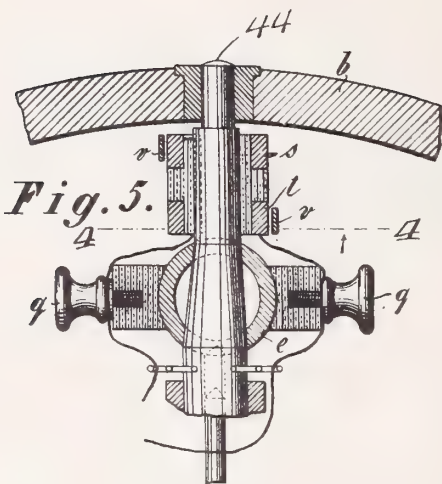
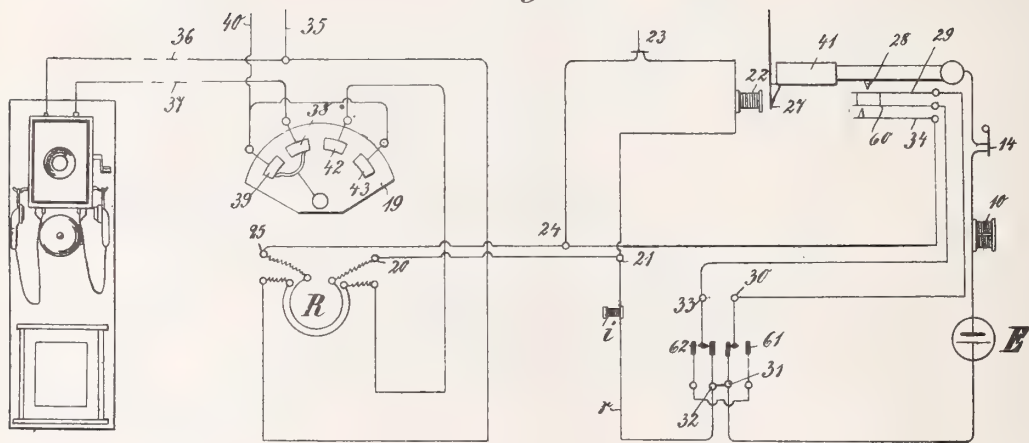


Fig. 6.



Witnesses:
Frank S. Ober
Haldo M. Chapin

Inventor:
Valdemar Poulsen
by *Wm. A. Rasmussen*
Att'y

UNITED STATES PATENT OFFICE.

VALDEMAR POULSEN, OF COPENHAGEN, DENMARK.

METHOD OF RECORDING AND REPRODUCING SOUNDS OR SIGNALS.

SPECIFICATION forming part of Letters Patent No. 661,619, dated November 13, 1900.

Application filed July 8, 1899. Serial No. 723,198 (No specimens.)

To all whom it may concern:

Be it known that I, VALDEMAR POULSEN, a subject of the King of Denmark, residing at Copenhagen, in the Kingdom of Denmark, have
5 invented certain new and useful Improvements in Methods of and Apparatus for Effecting the Storing up of Speech or Signals by Magnetically Influencing Magnetizable Bodies, (for which I have applied for patents
10 in England, No. 8,961, dated April 28, 1899; in Germany, dated December 9, 1898; in Austria, dated April 22, 1899; in Hungary, No. 6,494, dated May 1, 1899; in France, No. 276,184, dated April 26, 1899; in Belgium, No. 111,719,
15 dated April 26, 1899; in Italy, dated May 2, 1899; in Spain, dated April 26, 1899; in Portugal, dated May 8, 1899; in Switzerland, No. 21,005, dated April 25, 1899; in Russia, dated April 26, 1899; in Norway, No. 11,076, dated
20 April 26, 1899; in Sweden, dated March 20, 1899, and in Denmark, No. 1,260, dated December 1, 1898,) of which the following is a specification.

It has long been possible to transmit messages, signals, &c., by electrical means.

The present invention represents a very essential advance in this branch of science, as it provides for receiving and temporarily storing messages and the like by magnetically
30 exciting paramagnetic bodies. The solution of this problem is based on the discovery that a paramagnetic body, such as a steel wire or ribbon, which is moved past an electromagnet connected with an electric or magnetic transmitter, such as a telephone, is magnetically excited along its length in exact
35 correspondence with the signals, messages, or speech delivered to the transmitter, and, further, that when the magnetically-excited wire is again moved past the electromagnet it will reproduce the said signals, messages, or speech in a telephone-receiver connected with the said electromagnet.

The invention is of great importance for
45 telephonic purposes, as by providing a suitable apparatus in combination with a telephone communications can be received by the apparatus when the subscriber is absent, whereas upon his return he can cause the
50 communications to be repeated by the apparatus.

Further, the present invention will replace

the phonographs hitherto used and provide simpler and better-acting apparatus.

As is well known, in the usual phonographs 55 the vibrations of air transmitted to a membrane are caused by means of suitable mechanical parts to make indentations in a receptive body, which indentations can cause a membrane to repeat the said vibrations by 60 suitable mechanical means. Mechanical alterations of such bodies, however, give rise to disturbing noises, which apart from the expense of such apparatus is one of the principal reasons why the phonograph has not 65 come more extensively into use.

In the accompanying drawings one form of this invention is illustrated.

Figure 1 is a front elevation and partial section of the phonographic apparatus. Fig. 70 2 is a section on line xx of Fig. 1 looking up. Fig. 3 is a section on line yy of Fig. 1 looking down. Fig. 3^a is a detail view of the electromagnet and its carrier. Fig. 4 is a section on line 4 4 of Fig. 5. Fig. 5 is a section on 75 line 5 5 of Fig. 4. Fig. 6 is a diagrammatic representation of electrical connections designed for the purpose of explaining the mode of operation of the invention.

In the apparatus illustrated the paramagnetic body used consists of a steel wire which is spirally wound on a drum.

The construction of the apparatus is as follows:

a indicates a casing for a clockwork, one 85 of the wheels of which is indicated by a' . Upon this casing is supported a stirrup-shaped frame b , the two arms of which are arranged on opposite sides of a central spindle c . On this spindle is mounted a cylinder d , which 90 is held stationary by being fastened to the spindle in any suitable way, and the spindle itself is fixed to the casing.

e is a bow-shaped frame consisting of a piece of tubing bent into shape and having its ends 95 connected by an arm e' , mounted to turn on the spindle c . The upper end of the bow has a bearing at the middle of the frame b by means of a short stud 44, which passes through the bow and enters the frame b . Rotary motion is imparted to the bow e by means of the 100 clockwork in the casing a , which is provided with a wheel 13, engaging with a pinion 12 on the hub of the arm e' . A fixed ring 48, car-

rying two annular electrical contacts 49 on its upper surface is arranged immediately below the arm e' , and said arm is provided with a spring-mounted pin 23, adapted to be forced into connection with both of said electrical contacts for the purpose of electrically connecting them together.

Upon the surface of the cylinder d is wound a steel wire g in a uniform helix. On one of the arms of the bow e is placed a sleeve f , adapted to slide freely up and down on the bow, it being held in a fixed relation thereto by means of a tongue-and-groove connection or in any other suitable manner. This sleeve has pivoted to it a magnet-holder h , the poles of the magnet therein being indicated by i . The magnet-holder is provided with a tail-piece k , which is normally pressed upon by a spring l , tending to force the poles of the magnet out of contact with the wire g .

p represents a weight adjustably fixed on an arm o , pivoted to the sleeve f . The arm o is connected with the tail k by a spring m . Centrifugal force acting upon the weight p tends to throw the magnet-holder toward the cylinder d , and thus bring the poles of the magnet into contact with the wire g , in which operation the spring l is compressed, so that when the centrifugal force ceases said spring will act upon the tail-piece k to remove the poles of the magnet from the wire g . The arm o has two extensions o' and o'' , which serve as stops to limit the movement of the weight p in both directions. The sleeve is also provided with a finger o''' , the purpose of which will be explained hereinafter. With reference to the magnet i it may be stated that it may have one or two of its pole-pieces arranged to engage the wire g . If a single pole-piece is used, the end thereof will be rounded or made wedge-shaped to fit between two adjacent convolutions of the wire and in contact with both of them, while if the two pole-pieces are used, as is shown in the drawings, they may make contact with opposite sides of a single convolution of the wire, the poles being pointed for this purpose, or they may slide in the adjacent grooves between the wires and straddling one convolution.

The two wires r and r' , in which the magnet i is connected, lead from the magnet through the open slot in the bow e , thence upward through said hollow bow to a point near the upper end thereof, where they pass out through a flaring nozzle e'' , thence around the outside of a drum 17, through a hole in the side thereof, and thence upward to a pair of binding-screws q and q' , arranged on the opposite sides of the bow e at its middle point, the wires being slack between said binding-screws and the opening in the drum. From said binding-screws the wires lead on, respectively, to two insulated rings s and t on the short stud 44. Upon each of these rings a contact-spring v , attached to a block v' , rests, and to these springs the main wires are respectively connected by means of the binding-screws q' . The said drum 17 is

mounted freely on the upper end of the spindle c , and on its under side it has pivoted to it two weighted levers 18, each of which carries a spring forming a brake-shoe resting upon the surface of the fixed spindle c . These weighted levers are so arranged that centrifugal force will increase the pressure of the brake-shoes upon the spindle, and so retard the rotary motion of the drum 17. The drum also carries a pair of wings 16, which have a retarding effect upon the rotary motion of the drum. The drum is connected with the bow e by a flexible or yielding connection consisting of a number of wires 15, which are clamped to the drum by a conical nut 47, engaging with the hub 46 and with the bow by a similar nut 45, engaging with the end of the stud 44. It will now be seen that when the bow e rotates it will carry the drum 17 with it; but owing to the action of the brake 18 and the wings 16 there will be a certain amount of lagging on the part of the drum which will be permitted by the twisting of the wires 15.

The clockwork is normally prevented from rotating by the weight of the armature 11, which acts upon the brake, as shown in Fig. 1. The brake is released by the electromagnet 10 in a circuit with battery E and a cut-out 14, attached to the frame b .

The apparatus so far described is a phonograph, the operation of which may be now referred to.

Let it be assumed that speech or signals are being electrically transmitted over the circuit containing the magnet i , that the sleeve f is at the lower end of the bow, and that the machine is started by closing the circuit of magnet 10. The bow e immediately commences to rotate around the cylinder d . When the speed is sufficient, centrifugal force acting upon the weight p will cause the core of the magnet i to be thrown into contact with the wire g , whereupon the sleeve will be caused to slide upward upon the bow owing to the spiral arrangement of the wire on the cylinder. At the same time the undulations of current in the circuit of magnet i will vary the magnetism of said magnet, which variations will be successively imparted to the wire g . The message may continue until the sleeve f reaches the elevation of the cut-out 14, whereupon the finger o''' on the sleeve strikes said cut-out and opens the circuit of magnet 10. Armature 11 then falls and stops the clockwork, whereupon spring l withdraws the poles of the magnet i from wire g and the sleeve falls by gravity to its lower position. The brake 18 is adjustable, so that the lagging of the drum 17 behind the bow e will be just sufficient to wind the wires r upon the drum as the slack in said wires is created by the upward movement of the sleeve f . To reproduce the message which has thus been magnetically recorded, it is only necessary to put a receiving-telephone into circuit with magnet i instead of the transmitting-telephone and then start the machine again,

whereupon the sleeve will travel up on the bow and the poles of the magnet will traverse the wire *g*, the successively-varying magnetic condition of which will react upon the core of the magnet and cause the same undulations of current to be sent over the line to the receiving-telephone as were previously sent over the line to the magnet from the transmitting-telephone.

10 The connection of the apparatus to a telephone is shown in Fig. 6. A switch 19 is provided having four terminals 38, 39, 42, and 43. These terminals can be connected with each other in three different ways by means of the switch-lever. In the position shown in the drawings the two terminals 38 and 39 are connected together. This position establishes the circuit for the ordinary use of the telephone. The current passes through the conductor 35 and the conductor 36 to the telephone and through the conductor 37 and terminals 38 and 39 back to the conductor 40. The two conductors 35 40 constitute the outgoing and return lines. If the switch-lever is so adjusted as to connect the two terminals 38 and 42, the apparatus can then be used as a phonograph, and the transmitting-telephone belonging to the same station can then be used. To clearly explain this, the course of the current should be followed when the terminals 38 and 42 are connected. When the subscriber turns the crank-handle of his induction apparatus, a current will pass through the outer coil of the induction-coils *R*. The current issues from the telephone and passes over the conductor 36 to the outer coil of the induction-coils *R*, then through the terminals 42 to the terminal 38, and over the conductor 37 back to the telephone. A current is then induced in the inner coil of the induction-coils *R*, which will take the following course: It passes from the terminal 20 of the inner coil of the induction-coils *R* to the electromagnet 22, through the contact 23, conductor 24, and terminal 25 back to the inner coil of the induction-coils *R*. The electromagnet 22 is thus excited and the armature 27 attracted, whereupon a weighted block 41 is released and falls. By this means contact is made between the contact-piece 28 and spring 29, whereby the local circuit of the battery *E* is closed. The circuit is as follows: The current passes from the battery *E* through the electromagnet 10, contact 14, contact-piece 28, spring 29, terminals 30 31, and back to battery *E*. The electromagnet 10, Fig. 1, now attracts the armature 11, so that the clockwork is set in motion and the bow *e* rotated. The sleeve *f*, which has been resting upon the pin 23, begins to rise and the connection between the contacts 49 is broken. The contact 23 consequently exists only for an instant, so that the circuit of the conductors 20 21 22 23 24 25 is open during the operation of the clockwork and apparatus. Now during the rise of the sleeve *f* and while the electromagnet *i*, Fig. 3, is in contact with the

steel wire *g* in the manner described the subscriber can speak into his transmitter and the spirally-wound steel wire *g* will be correspondingly magnetically excited. The course of the current in this case is as follows: It passes from the telephone apparatus through the conductor 36, the outer coil of the induction-coils *R*, the terminals 42 38, and conductor 37 back to the transmitter. In exact correspondence with the matter spoken into the transmitter currents are induced in the inner induction-coil. Such currents issue from the terminals 20 21, pass through the electromagnet *i*, conductor *r*, terminals 32 33, contact-springs 60 34, and terminals 24 25 back to the inner induction-coil. The contact between 60 and 34 is also effected by the falling of block 41. The electromagnet *i* is magnetized in correspondence with the matter spoken and transfers its magnetism to the steel wire *g*. The matter thus fixed can now be transmitted over the line by using the third connection—that is, by connecting the terminals 42 and 43 of the switch 19.

If, for example, the message, "The subscriber is not at home at present, but will return at four o'clock, at which time please ring again," is fixed to the steel wire and a subscriber at some other station calls the former, when the contact-pieces 42 43 are connected together the following circuit will be described: The induced current from the transmitting-station will first pass over the conductor 35 to the outer coil of the induction-coils *R* and then through the terminals 42 43, whereupon it will pass through these to the line 40, because the terminal 43 is connected with the terminal 39. The line-current will accordingly not pass through the telephone of the receiving-station; but because the contact 23 is then closed the electromagnet 22 is again excited by the current generated in the inner coil of the induction-coils *R* and the drum *d* is rotated. The electromagnet *i* will slide along the fixed wire *g* and gradually rise with the sleeve *f* and will be magnetized in accordance with the speech fixed on the wire. The currents induced thereby pass from the electromagnet *i*, Fig. 7, through the terminals 33, contact-springs 60 and 34, terminals 24 25 to the inner coil of the induction-coils *R*, and then through the terminals 20 and 21 to the electromagnet *i*. In the inner coil of the induction-coils *R* a current is induced corresponding to the speech fixed to the steel wire, which current likewise acts in the outer coil of the induction-coils *R* and passes thence through the terminals 42 43 39 to the line conductor 40 and back over the conductor 35 into the outer coil of the induction-coils *R*. The subscriber at the transmitting-station now hears through his receiver the message fixed to the steel wire and knows that in order to speak with the subscriber at the receiving-station he must call him up at four o'clock.

In order to demagnetize the steel wire *g*,

Fig. 1, the terminals 30 and 33, Fig. 7, are connected with 61 and 62, whereupon the following connection is made: The current passes from battery E through the terminals 5 31 and 32 to the electromagnet *i*, through the terminals 21 20, inner coil of the induction-coils R, terminal 25, contact-springs 34 60, contacts 33 62 61 30, contact-spring 29, contacts 28 14, and electromagnet 10 back to the battery 10 E. The electromagnet *i* is in this position of the switch uniformly magnetized by the battery E and demagnetizes thereby the steel wire *g* on the bow *e* rotating.

For telegraphic purposes the invention can 15 also be used with advantage. It is in such case only necessary to receive the current impulses transmitted over the line in the electromagnet while it is in contact with the paramagnetic body. The paramagnetic body 20 may be moved past the electromagnet, or vice versa.

Having described my invention, I claim—

1. The method of recording and reproducing speech or signals which consists in im- 25 pressing upon an electric circuit containing an electromagnet, undulations of current corresponding to the sound-waves of speech or to the signals; simultaneously bringing successive portions of a magnetizable body under

the influence of said electromagnet and there- 30 by establishing in said body successively-varying magnetic conditions; and finally subjecting an electromagnet connected in a circuit, successively to the various magnetic 35 conditions established in said body, substantially as described.

2. The method of recording and reproducing speech, signals, &c., which consists in imparting magnetic conditions successively to a magnetizable body or surface, said conditions 40 varying in accordance with the sound-waves produced by said speech or signals and then subjecting a reproducing apparatus to said magnetic conditions successively.

3. The method of storing up signals or mes- 45 sages represented by undulating or irregular currents, which consists in imparting to various portions of a magnetizable body, magnetic conditions corresponding to said undulating or irregular currents. 50

In testimony whereof I have hereunto signed my name in the presence of two witnesses.

VALDEMAR POULSEN.

Witnesses:

VALDEMAR CHRISTENSEN,
NIELS CHRISTIAN BÖTCHER.

No. 661,662.

Patented Nov. 13, 1900.

G. KORYTOWSKI.
STYLUS MAGAZINE FOR GRAMOPHONES.

(Application filed Aug. 22, 1899.)

(No Model.)

Fig. 1.

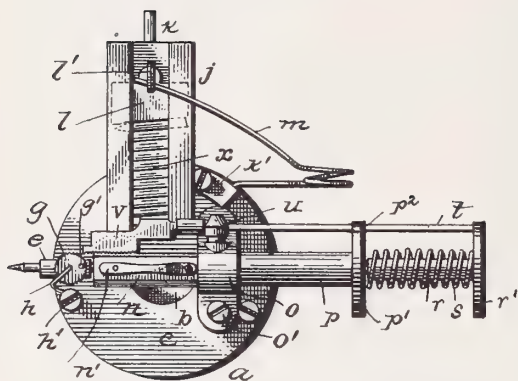


Fig. 2.

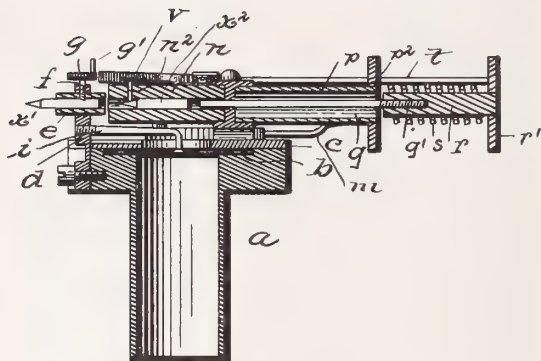
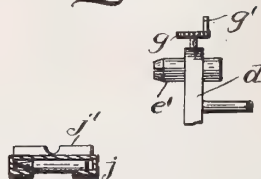


Fig. 3.



WITNESSES

Edw. Stark
Jas. A. Richmond.

INVENTOR

Gustav Korytowski
by *G. Dittmar*
his Attorney

UNITED STATES PATENT OFFICE.

GUSTAV KORYTOWSKI, OF LEIPSIC, GERMANY.

STYLUS-MAGAZINE FOR GRAMOPHONES.

SPECIFICATION forming part of Letters Patent No. 661,662, dated November 13, 1900.

Application filed August 22, 1899, serial No. 728,098. (No model.)

To all whom it may concern:

Be it known that I, GUSTAV KORYTOWSKI, a subject of the German Emperor, residing at Leipsic, in the Empire of Germany, have
5 invented certain new and useful Improvements in Devices for Changing the Tracers of Sound-Reproducing Apparatus; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as
10 will enable others skilled in the art to which it appertains to make and use the same.

My present invention has reference to talking-machines.

The reproducers in gramophones, phonographs, and the like are usually provided with a needle or its equivalent which follows the engraved lines of the record, and the needles being generally of soft metal are liable to wear, the wear being in some of the apparatus,
15 especially in gramophones, a rapid one, thus necessitating frequent changing. This has heretofore been generally done by hand, but owing to the delicate mechanism of the reproducer a certain skill is required for inserting and fixing the needles, which obviously cannot be done by every one.

The object of this invention is to provide a means for automatically discarding the used needle and simultaneously replacing it with
30 a fresh one.

To this end the invention consists in a magazine for carrying a plurality of needles, a needle-holder to which the needles are fed, a means for feeding the needles to said needle-holder, and in certain details of construction,
35 all as hereinafter described and claimed.

In order to more fully describe and ascertain the nature of the said invention, reference will be had to the accompanying drawings, which illustrate a preferred embodiment of my invention, and wherein—

Figure 1 is a face view showing the general arrangement. Fig. 2 is a longitudinal section of Fig. 1, and Fig. 3 represents details showing a transverse section through the magazine and a modification of the needle-holder.

The invention is shown as applied to a reproducer of the Berliner system.

50 *a* designates the sound-box, having diaphragm *b*, retained by disk *c* in the usual manner. The sound-box is provided with a

lateral recess, in which is mounted the needle-holder support *d*, secured by a screw or other suitable means. The needle-holder *e*
55 may consist of a tubular member integral with the support or may be tapered and split longitudinally at its forward end, as shown at *e'* in Fig. 3, so as to assume the function of a clamp to prevent the operating-needle from
60 being displaced.

The needle-holder is provided with a set-screw *f*, the head of which is formed as a pinion *g*, carrying a pin *g'*, which prevents the screw from being fully rotated by bearing
65 against a spring *h*, retained by screw *h'* on the sound-box.

i designates the stylus connecting the needle-holder support *d* and diaphragm *b* in the usual manner.

The magazine *j* is preferably constructed of sheet metal and consists of a rectangular member having a sight-opening extending the length thereof. The needles are loosely received therein and superposed one upon the
75 other, as shown at *x*, with their points facing the needle-holder.

The magazine may be secured to the sound-box in any suitable manner. In the present instance I have shown it as being received at
80 its base in a box or trough *n*, mounted in a support upon the sound-box. This magazine is provided with a grooved shoulder *j'*, in which is adapted to engage a spring-wire *k*, mounted in a segmental plate *k'*, secured to
85 the sound-box. The magazine has a pusher or tensioning device for the needles, which comprises a presser-block *l*, having its under side inclined to coincide with the tapered form of the needles and having a shank *l'* extending through the sight-opening, upon
90 which is adapted to bear one arm of a spring *m*, the other arm of the spring being retained in plate *k'*.

Any suitable means may be employed for
95 feeding the needles to the needle-holder. In the present instance I have shown a box or trough *n*, into which the magazine feeds, said box being axially alined with the needle-holder and provided with a lateral opening
100 closed by a reed or spring *n'*, having an inwardly-protruding pin *n''*, adapted to bear upon the tapered point of the second needle to prevent the same from creeping forward

against the operating-needle. Said trough n is integral with or otherwise mounted upon a support o , retained by screws o' upon the sound-box. The support o has a tubular extension or sleeve p , provided at its outer end with a flange p' , having an eye p^2 . (Shown dotted in Figs. 1 and 2.) A plunger or rod q is guided centrally of said sleeve to be in axial alinement with the needle in trough n and is threaded, as at q' , to be received in a cylindrical block r , having a flange r' . A coil-spring s is mounted upon said block and impinges at its ends against the flanges p' and r' , normally tending to keep the rod q retracted. The flange r' has rigidly connected therewith a rod t , guided in the eye p^2 and in a guide u , secured to the support o . The rod t carries at its other end a rack v , attached thereto in any suitable manner and adapted to engage the teeth of pinion g when the rod q is actuated. The magazine being supplied with needles, the lowermost one will lie in the trough n , and it will be seen that by depressing the rod q this needle will be pushed forward to its proper position in the needle-holder, as shown at x' , where it is retained by the set-screw g , which is actuated by the rack v . The next needle x^2 will take the place of the preceding one, and it will be seen that upon repeating this operation the second needle will operate to eject the used needle.

It is obvious that various changes in the form, construction, combination, and arrangement of parts of my invention may be resorted to without sacrificing any of the advantages or departing from the spirit of my invention.

Having thus described my invention, I claim—

1. A reproducer for talking-machines having a plurality of reproducing-needles in a substantially common plane and automatic means for discarding the used needle and simultaneously replacing it with a fresh one.

2. In a reproducer for talking-machines, a magazine containing a number of reproducing-needles arranged in a substantially common plane, and means for putting said needles into position, one after another, to reproduce sound.

3. In a reproducer for talking-machines, a magazine, a number of reproducing-needles in superposed relation, and automatic means for simultaneously ejecting the used needle and replacing it with a fresh one.

4. In a reproducer for talking-machines, a magazine containing a number of reproducing-needles in superposed relation and having a downward feed, and automatic means for simultaneously ejecting the used needle and replacing it with a fresh one.

5. In a reproducer for talking-machines, a magazine attached to the sound-box and containing a number of reproducing-needles a needle-holder, and means for feeding said needles to the needle-holder, consecutively.

6. In a reproducer for talking-machines, a magazine attached to the sound-box, a plu-

rality of reproducing-needles contained in said magazine under tension, a needle-holder alined with the lowermost needle, and means for feeding said needles to the needle-holder, consecutively.

7. In a reproducer for talking-machines, a magazine attached to the sound-box, a plurality of reproducing-needles contained in said magazine, a needle-holder, means for keeping the lowermost needle in axial alinement therewith, a plunger mechanism for causing the needles to be inserted in the needle-holder, one after another, in position to reproduce sound.

8. In a reproducer for talking-machines, a magazine attached to the sound-box, a plurality of reproducing-needles contained in said magazine, a clamping needle-holder, a plunger device, and means connected with the needle-holder whereby when the plunger is actuated, the used needle is released and a new one substituted.

9. In a reproducer for talking-machines, a magazine attached to the sound-box, a plurality of reproducing-needles contained in said magazine, a clamping needle-holder, a plunger device axially alined with said needle-holder and the lowermost needle, means connected with the needle-holder whereby when the plunger is actuated, the used needle is released and a new one substituted, and suitable means to prevent a second needle working forward while a needle is operating.

10. A magazine for talking-machines, having a downward feed and containing a plurality of superposed reproducing-needles under tension in combination with means for automatically feeding said needles to the needle-holder.

11. A magazine for talking-machines, adapted and arranged to contain a plurality of needles and having a sight-opening, a spring-block bearing upon said needles, and a lateral slot near the base of said magazine, with a reed or spring having a projection normally bearing upon the lowermost needle to hold same in position.

12. The combination in a talking-machine, of a reproducer having a magazine provided with a sight-opening extending the length thereof and with a slot near its lower end, a plurality of reproducing-needles contained in said magazine, a clamping needle-holder, a plunger device axially alined with said needle-holder and the lowermost needle, means connected with the needle-holder whereby when the plunger is actuated the used needle is discarded and a new one substituted therefor, and a spring having a projection located in said slot and normally tending to prevent a second needle working forward while a needle is operating.

13. The combination, in a talking-machine, of a reproducer having a magazine attached to the sound-box and provided with a sight-opening extending the length thereof and with a

slot near its lower end, a removable connection between the magazine and the sound-box, a plurality of reproducing-needles contained in said magazine, a clamping needle-holder, a
5 plunger device axially alined with said needle-holder and with the lowermost needle, means connected with the needle-holder whereby when the plunger is actuated the used needle is discarded and a new one substituted therefor, and a spring having a nose
10 or projection located in said slot and normally tending to prevent a second needle from working forward while a needle is operating.

15 14. The combination in a talking-machine, of a reproducer having a magazine attached to the sound-box and provided with a sight-opening extending the length thereof, a removable connection between the magazine
20 and the sound-box, including a laterally-slot-

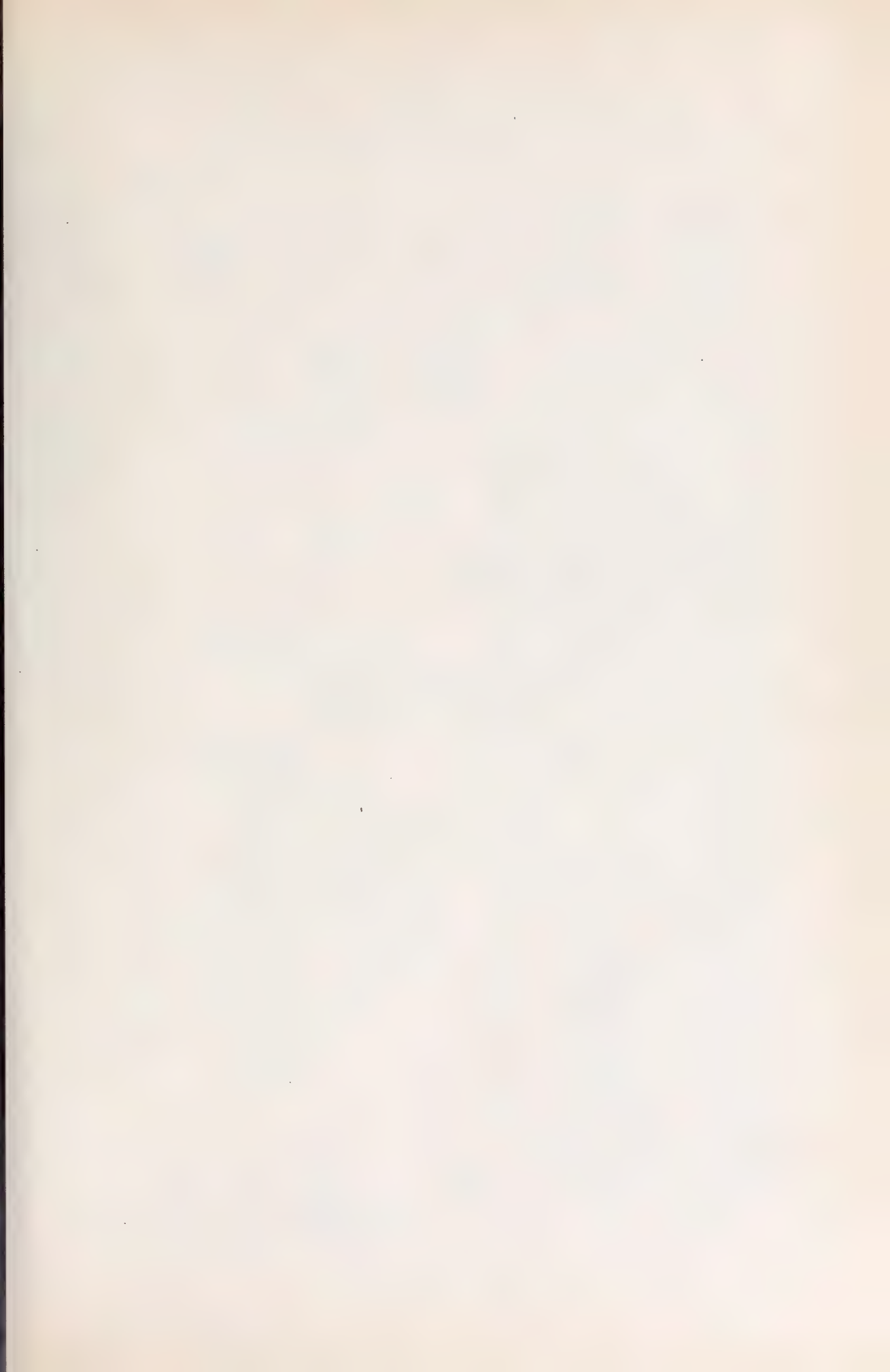
ted trough into which the magazine is adapted to feed a plurality of reproducing-needles contained in said magazine, a clamping needle-holder, a plunger device axially alined with said needle-holder and with the lower-
25 most needle, means connected with the needle-holder whereby when the plunger is actuated the used needle is discarded and a new one substituted therefor, and a spring having a nose or projection protruding through the
30 slot in said trough and normally tending to prevent a second needle from working forward while a needle is operating.

In testimony that I claim the foregoing as my invention I have signed my name in presence of two subscribing witnesses.

GUSTAV KORYTOWSKI.

Witnesses:

EMIL F. HOFMANN,
B. H. WARNER, Jr.



No. 662,301.

Patented Nov. 20, 1900.

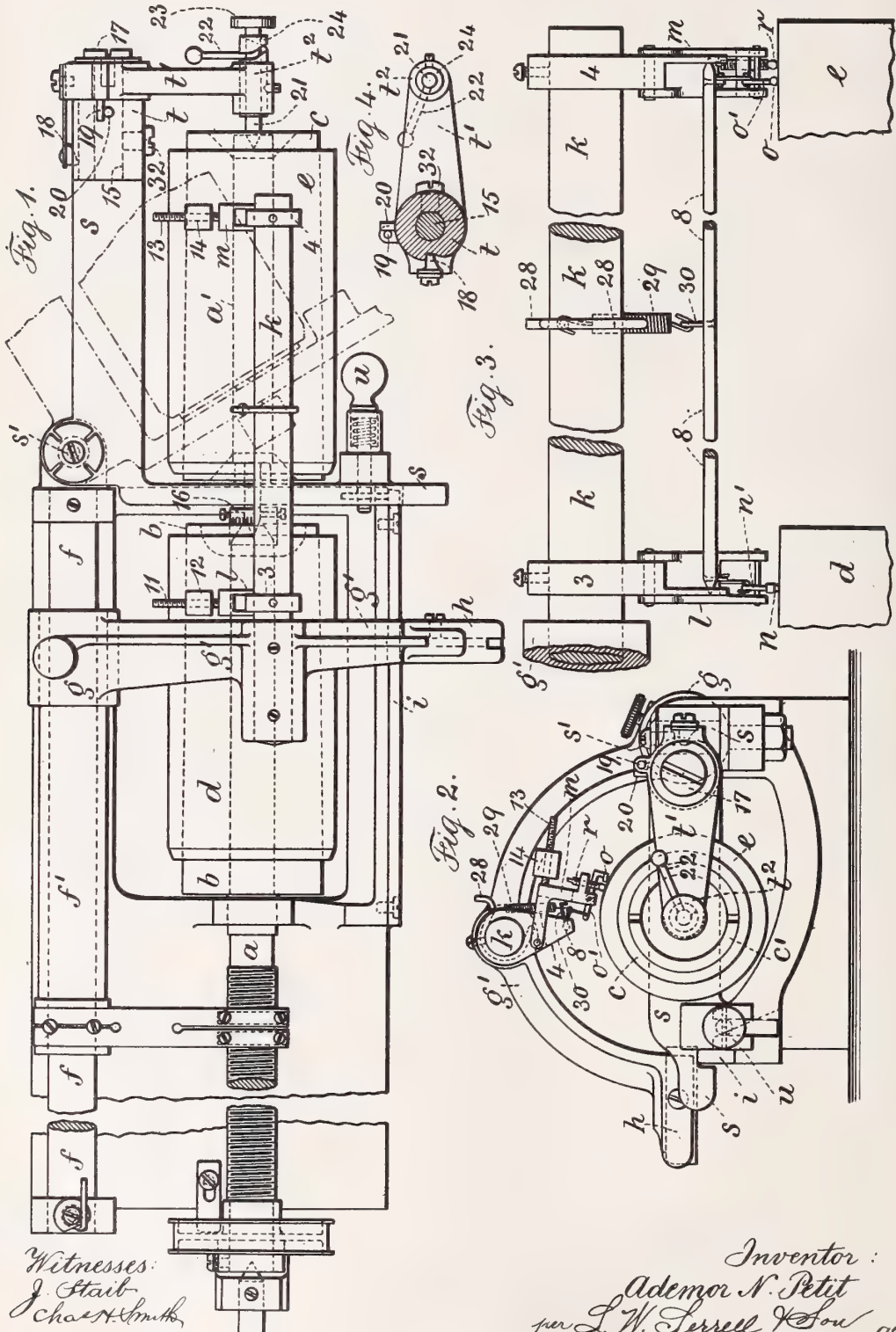
A. N. PETIT.

MACHINE FOR REPRODUCING PHONOGRAPH RECORDS.

(Application filed Mar. 16, 1900.)

(No Model.)

2 Sheets—Sheet 1.



Witnesses:
J. Stair
Chas. H. Smith

Inventor:
Adenor N. Petit
per L. W. Terrell & Son attys



No. 662,301.

Patented Nov. 20, 1900.

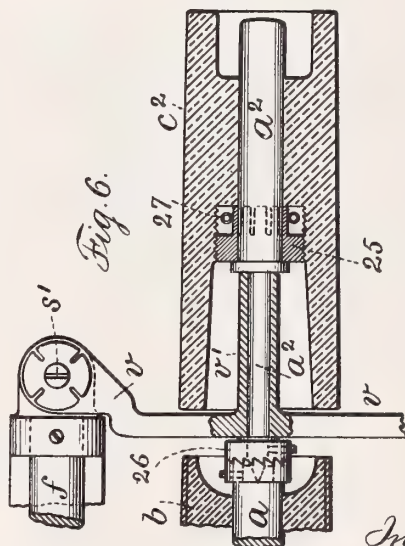
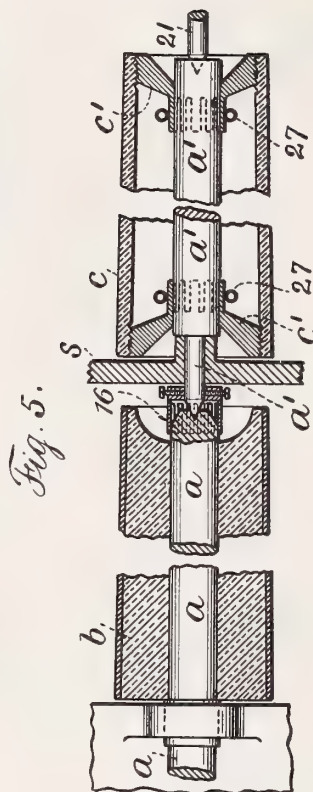
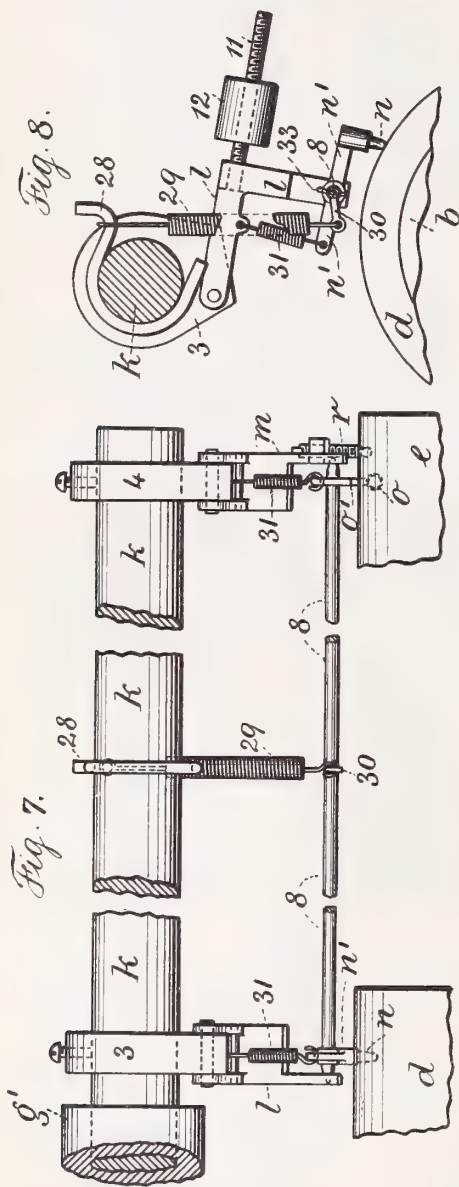
A. N. PETIT.

MACHINE FOR REPRODUCING PHONOGRAPH RECORDS.

(Application filed Mar. 16, 1900.)

(No Model.)

2 Sheets—Sheet 2.



Witnesses:
J. Staib
John A. Smith

Inventor:
Ademor N. Petit
per L. W. Surrall & Son attys

UNITED STATES PATENT OFFICE.

ADEMOR N. PETIT, OF NEWARK, NEW JERSEY.

MACHINE FOR REPRODUCING PHONOGRAPH-RECORDS.

SPECIFICATION forming part of Letters Patent No. 662,301, dated November 20, 1900.

Application filed March 16, 1900. Serial No. 8,917. (No model.)

To all whom it may concern:

Be it known that I, ADEMOR N. PETIT, a citizen of the United States, residing at Newark, in the county of Essex and State of New Jersey, have invented a new and useful Improvement in Machines for Reproducing Phonograph-Records, of which the following is a specification.

My present invention is designed as an improvement upon the device shown and described in my application for Letters Patent filed October 27, 1899, Serial No. 734,934, and which application was duly allowed February 24, 1900.

The present invention is designed to make more effective the devices of my former application and to facilitate readily placing the record and the blank on their respective cylinders and the after removal of the same.

In carrying out the present invention I employ a shaft for the record-cylinder and a shaft for the blank-cylinder and means for coupling together the said shafts; also, a support for the shaft for the blank-cylinder adapted for separating the respective shafts or uncoupling the same at pleasure. The shafts when coupled are in line and a following-style is in engagement with the record-cylinder and a reproducing-style is in engagement with the blank-cylinder. These parts are so supported and connected that the reproducing-style closely follows the movement of the following or tracing style, and the two move in unison, and in connection with these parts I employ adjustable devices for regulating the pressure or the weight applied upon the said styles. In connection with the sleeve for the blank-cylinder I employ an arm adapted to swing on the frame supporting the said sleeve, so as to permit the ready removal from the sleeve of the cylinder after the record has been made thereon.

In the drawings, Figure 1 is a plan view representing my present improvements. Fig. 2 is an end elevation of the same. Fig. 3 is an elevation and partial section of the arm and the supports for the recording and reproducing styles. Fig. 4 is a cross-section and partial elevation of part of the swinging frame carrying the sleeve for the blank-cylinder and the movable arm at one end of the same. Fig. 5 is a broken sectional plan through the sleeve

for the recording-cylinder and the sleeve for the blank-cylinder and their respective shafts. Fig. 6 is a partial plan and section representing a modification of the devices for supporting the sleeve for the blank-cylinder. Fig. 7 is an elevation; and Fig. 8, a cross-section and partial elevation representing a modified form of support and devices for operating the recording and reproducing styles, which is also the preferable form of apparatus. Figs. 3, 5, 6, 7, and 8 are of larger size than Figs. 1, 2, and 4 for clearness.

The shaft *a* is mounted in and supported by suitable bearings, and upon the said shaft at one end I place the fixed sleeve or carrier *b* for the record-cylinder, and *c* represents the sleeve or carrier for the blank-cylinder.

d represents the record-cylinder, and *e* the blank-cylinder. These cylinders are presumed to be of the same diameter and to have parallel surfaces. They are, however, made with tapering inner surfaces to fit upon the tapering sleeves or carriers *b c*.

The back rod *f* is supported in any suitable manner and by a suitable frame or foundation, which also carries the bearings for the shaft *a*. The sleeve *f'* surrounds the rod *f* and is capable of a longitudinal movement thereon, and surrounding and clamped to the sleeve *f'* is a sleeve *g*, the set-screw for clamping the same being shown in Figs. 1 and 2.

Movement is imparted to the sleeve *f'* by the usual screw-feed, (shown in Fig. 1,) but which being of ordinary character requires no further description. The sleeve *g* carries a curved arm *g'*, extending over above the shaft *a* and the record-cylinder *d*, and at the outer end of the arm *g'* is an adjusting-bar *h*, held to the arm by a screw and bearing upon the rest-bar *i* below the same. The bar *h* occupies a slotted portion of the outer end of the arm *g'*, and said bar can be raised or lowered slightly in said slotted portion to vary its position upon said arm, and the position of said bar on the arm *g'* determines the position of the following and reproducing styles above the record and blank cylinders when said arm *g'* is lowered and the under surface of the bar *h* rests upon the bar *i*. This curved arm *g'* is provided with a socket receiving one end of the arm *k*, which arm *k* projects out from the said curved arm *g'* and occupies

a position transversely to the said arm and parallel with the shaft *a* and the cylinders. Upon this arm *k* are heads 34, that are adjustable and held in place by set-screws, 5 (shown in Fig. 3,) and pivoted to these heads are the carrier-arms *l m*, the carrier-arm *l* supporting the recording-style and being pivoted to the head 3 and the carrier-arm *m* supporting the reproducing-style and being 10 pivoted to the head 4.

The recording-style *n* and the reproducing-style *o* are each on the ends of bent arms *n' o'*, pivoted between the parts of the carrier-arms *l* and *m* at their lower ends. In Figs. 1, 2, 15 and 3 the connecting-bar 8 is pivoted to the lower ends of the heads 3 and 4 and extends across from one head to the other, and the said bar is provided with a central finger 30 and short end fingers 34, and I provide a clip 20 28, in the form of a wire bent around the arm *k*, to frictionally engage the same, and a spring 29 is connected to the clip 28 at one end and at the other end to the center finger 30 of the connecting-bar 8, and the fingers 34 at the 25 ends of the bar 8 have links extending therefrom to the ends of the arms *n'* and *o'* of the recording and reproducing styles, and I provide threaded bars 11 and 13, connected to and extending out from the carrier-arms *l* 30 and *m*, and upon said threaded bars 11 and 13 are the weights 12 and 14, adjustable along the said bars to bring the desired leverage and weight upon the styles, and I provide also a guide *r*, vertically adjustable and passing 35 through a part of the carrier-arm *m*, the office of which is to rest upon the surface of the blank-cylinder *e* and following the same to give location to the reproducing-style *o* by following the contour of the surface of the 40 blank-cylinder.

By reference to Figs. 2 and 3 it will be seen that while the weight 14 tends to force downward the carrier-arm *m* toward the cylinder *l* the spring 29, by its contractile action, tends 45 to draw upward the finger to which it is attached and to turn the connecting-bar 8 and in its action to raise the end fingers and links connecting the same to the arm *o'* of the reproducing-style, the tendency being thus to 50 press the style into the surface of the cylinder, while the action of the weight is to hold the carrier-arm down, with the surface of the guide *r* positively in contact with the surface of the cylinder. The action of the weight 12 55 upon the recording-style is somewhat similar, because it bears down the carrier-arm *l* and keeps the point of the recording-style not only in the fine groove upon the surface of the cylinder, but causes the same to follow all the 60 delicate undulations therein. It will therefore be seen that all the slight movements of the recording-style are imparted to the bar 8 and from the bar 8 to the reproducing-style, so that the same cuts into the surface of the 65 blank-cylinder to a degree corresponding with the depth of the groove and undulations on the record.

In the modification and preferable form shown in Figs. 7 and 8 the connecting-bar 8 extends across between the lower ends of the 70 carrier-arms *l m*, and the arms *n' o'* of the recording and reproducing styles are positively connected to this bar 8. In this form I also employ the clip 28 and the spring 29, with the lower end of the spring 29 connected to an 75 arm 30, secured centrally of the connecting-bar 8, the ends of the arms *n'* and *o'* being connected directly to the carrier-arms *l* and *m* by springs 31 31, acting as a compensating-spring between the carrier-arm and the arm 80 *n'*, according to the place at which the weight 12 is placed along the threaded bar 11, while the spring 29 acts, through the arm 30 and the connecting-bar 8, to force the styles against the surface of the record and blank cylinders. 85 Otherwise the structure of the parts carrying the recording and reproducing styles are practically alike.

The end of the shaft *a* is tapered (see Fig. 5) and provided with a center, and I provide 90 an L-shaped frame *s*, pivoted at *s'* to a bracket of the main frame. The shaft *a'* is centered at one end and reduced at the other end to pass through a short hub 35, made as a part of the frame *s*, and this end of the shaft *a'* is 95 pointed, and a spring-coupler 16 is secured thereto and rotates therewith, the said spring-coupler passing over the reduced end of the shaft *a* and the point of the shaft *a'* passing into the center at the end of the shaft *a*, thus 100 coupling the shafts *a* and *a'* and causing them to aline.

Heads *c'* frictionally surround the shaft *a'*—that is to say, these heads are provided with friction-hubs—and their peripheries screw 105 into the ends of the sleeve *c*, and they are adapted to be forced upon the shaft *a'*, and I provide helical ring-springs 27, which surround the friction-hubs of the heads *c'*, so as to insure the gripping action of the same upon the 110 shaft. The portion of the frame *s* at right angles to the shafts *a a'* sets over the rest-bar *i* of the frame, and a spring-actuated latch *u*, pivoted to the frame, is employed to engage this end of the frame *s* and hold the same to the 115 main frame of the machine, and the portion of the frame *s* that is parallel with the shaft *a'* is reduced to form a stud end 15, that receives upon it the sleeve *t*. This sleeve *t* is held in a fixed position by a set-screw 32, and 120 the sleeve *t* is notched along the back portion parallel with the stud end 15, (see Figs 1 and 4,) and the said sleeve *t* is provided with a pin 20. Around the end of the stud 15 is received the hub of an arm *t'*, the said arm 125 being maintained in its relation to the said sleeve by a locking-screw 17 and washer, which screw 17 is received in a threaded opening in the end of the stud 15. A spring-pawl 18 and a pin 19 are connected to the 130 hub of this arm *t'*, the pin 19 being adapted to come against the pin 20 to form a positive stop, bringing the axis of the arbor 21 into alinement with the shaft *a'*, and the spring-

pawl 18 is adapted to pass into the notch in the back of the sleeve t to assist in determining this position, and it is also adapted to bear upon the surface of the sleeve t to produce a friction capable of holding the arm t' in an upright position and prevent the same falling during the removal of a record or the placing of a blank.

Through the hub t^2 , on the outer end of the arm t , passes an arbor pointed at the left-hand end to pass into the center or socket on the end of the shaft a' to form a bearing for the outer end of the said shaft. This arbor 21 carries an arm 22 and a knurled head 23, and the same passes through a cam-sleeve 24, secured in the hub end t^2 . It will thus be seen that the arbor 21 can be rotated either by the fingers upon the knurled head 23 or by the fingers grasping the arm 22 and imparting a partial rotation to the arbor, which with the action of the cam-sleeve 24 withdraws the point of the arbor 21 sufficiently from the end of the shaft a' to permit the arm t' to be swung out of the way of the sleeve c of the blank-cylinder and of the record or blank e thereon.

In the operation of the parts and after the record and blank cylinders are in place and the styles are set for the reproducing operation, the shaft a is rotated by any suitable means. I have shown in Fig. 1 a pulley at the left-hand end of the shaft for this purpose, and by the rotation of the shaft a and the operation of the usual screw-feed the sleeve g , the curved arm g' , and the styles and the devices supporting the same are moved along over the surface of the record and blank cylinders for the purpose of reproduction, the record-cylinder d and blank-cylinder e being in the meantime rotated beneath the styles. When the record has been reproduced on the cylinder e , the arbor 21 is turned and the arm t' swung to one side to release the cylinder e , which is removed from the sleeve c . The latch u is then swung out of the way and the arm s , with the shaft a' and the sleeve c , turns on the pivot s' into and beyond the position shown by dotted lines, Fig. 1, simultaneously uncoupling the shafts a' and a at the spring-coupler 16, so that access is given to the record-cylinder d for its removal, after which another record can be placed upon the sleeve b , the frame s and the parts be again coupled and connected, and another blank-cylinder e be placed upon the sleeve c , and the arbor 21 be again brought into position and the styles be placed to the starting-point for the reproduction of other records.

In the modification shown in Fig. 6 the part of the frame s parallel with the shaft a' , together with the sleeve t and the arm t' and the arbor 21, is dispensed with and instead thereof I provide a frame v , also pivoted at s' to a bracket of the main frame, which frame is made with a tubular extension v' , through which passes the smaller portion of the shaft a^2 , and on the left-hand end of the said shaft, as shown in the drawings, is part of a clutch

26, engaging the other part of the clutch upon the shaft a .

The sleeve c^2 is made slightly different in Fig. 6 from the structure shown in Fig. 5. In this form a head 25, with friction-fingers and a ring-spring 27, is employed, the sleeve c^2 partially surrounding the shaft a^2 and screwing upon the head 25. From this modification it will be seen that the blank-cylinder can be placed upon the sleeve c^2 or removed therefrom at pleasure without the necessity of operating any mechanical devices, and that when it is desired to remove the record from the sleeve b the frame v is operated in a like manner with the frame s . (Shown in Fig. 1.)

The recording-style n and its arm n' (see Figs. 7 and 8) are preferably secured to the connecting-bar 8 by a pin 33, so that the parts turn together axially of the bar 8; but between the parts there is a looseness that permits of a slight lateral swinging movement of the arm n' in relation to the bar 8 to provide for slight inequalities in the necessary movement of the recording-style n .

I claim as my invention—

1. In a machine for reproducing phonograph and similar records, the combination with a reproducing device, of a shaft and a sleeve fixed thereon to receive the record-cylinder, a shaft and a sleeve thereon to receive the blank-cylinder, means for supporting the same and for coupling the same to and in line with the shaft of the record-cylinder and by which means the said parts are separated at pleasure, substantially as set forth.

2. In a machine for reproducing phonograph and similar records, the combination with a reproducing device, of a shaft and a fixed sleeve thereon to receive the record-cylinder, a shaft and a sleeve thereon for receiving the blank-cylinder, a support for the said shaft pivoted to the frame of the machine and adapted to support the shaft and sleeve of the blank-cylinder in alinement with the shaft and sleeve of the record-cylinder, a coupling for connecting the two shafts and a means for locking the said support to the frame of the machine, substantially as set forth.

3. In a machine for reproducing phonograph and similar records, the combination with a reproducing device, of a shaft and a fixed sleeve thereon to receive the record-cylinder, a shaft and a sleeve thereon to receive the blank-cylinder, a support for the said shaft pivoted to the frame of the machine and adapted to support the shaft and sleeve of the blank-cylinder in alinement with the shaft and sleeve of the record-cylinder, a coupling for connecting the two shafts and a means for locking the said support to the frame of the machine, an arbor and swinging support for the same connected to the support for the blank-cylinder, substantially as set forth.

4. In a machine for reproducing phonograph and similar records, the combination

with a reproducing device, of a shaft, a sleeve fixed thereon and adapted to receive the record-cylinder, a frame pivoted to the main frame and having a portion at right angles to the aforesaid shaft, and a portion parallel with the same, a shaft and a sleeve for the blank-cylinder and bearings for connecting the same to the said frame, the parts being so adjusted that the said shafts are in line, a coupler for mechanically uniting the respective adjacent ends of the said shafts, and a means for connecting the part of the frame at right angles to the shaft to the frame of the machine, an arbor and a swinging support therefor mounted upon the part of the frame parallel with the said shafts, substantially as set forth.

5. In a machine for reproducing phonograph and similar records, the combination with a reproducing device, of a shaft, a sleeve fixed thereon and adapted to receive the record-cylinder, a frame pivoted to the main frame and having a portion at right angles to the aforesaid shaft and a portion parallel with the same, a shaft and a sleeve for the blank-cylinder and bearings for connecting the same to the said frame, the parts being so adjusted that the said shafts are in line, a coupler for mechanically uniting the respective adjacent ends of the said shafts, and a means for connecting the part of the frame at right angles to the shaft to the frame of the machine, an arbor and a swinging support therefor mounted upon the part of the frame parallel with the said shafts, a spring-pawl and stops for determining the position of the arbor and its swinging support, and a cam-sleeve by which the arbor is moved longitudinally to release the shaft of the blank-cylinder, substantially as set forth.

6. In a machine for reproducing phonograph and similar records, the combination with the shaft *a* and the sleeve *b* for the record-cylinder, of a pivot *s'* upon a bracket of the main frame, a frame pivotally connected to the said bracket at the said pivot and normally occupying a position at right angles to the shaft *a*, the said frame having a tubular portion or hub, a second shaft reduced at one end and passing through the hub or sleeve of the said frame, a coupling device between and connecting the adjacent ends of the said shafts in line, a sleeve around and connected to the second shaft and upon which is mounted the blank-cylinder, substantially as set forth.

7. In a machine for reproducing phonograph and similar records, the combination with a reproducing device, of the shaft *a*, the sleeve *b* surrounding the same and adapted to receive the record-cylinder, a frame and a pivot connecting the same with a bracket of the main frame, a part of said frame normally lying at right angles to the shaft *a*, and a means for locking the same to the main frame, the said frame having a sleeve or hub, a shaft reduced in part and at the reduced

part passing through the sleeve or hub of the frame, a sleeve for supporting the blank-cylinder and heads *c'* screwing into the respective ends of the said sleeve and having friction-hubs surrounding the enlarged portion of the said shaft, a spring-coupler secured to the end of the reduced portion of the shaft of the blank-cylinder and adapted when the shafts come together in line to pass over the end of the shaft *a* in coupling the shafts together.

8. In a machine for reproducing phonograph and similar records, the combination with a reproducing device, of a shaft *a*, the sleeve *b* surrounding the same and adapted to receive the record-cylinder, a frame and a pivot connecting the same with a bracket of the main frame, a part of said frame normally lying at right angles to the shaft *a*, and a means for locking the same to the main frame, the said frame having a sleeve or hub, a shaft reduced in part and at the reduced part passing through the sleeve or hub of the frame, a sleeve for supporting the blank-cylinder and heads *c'* screwing into the respective ends of the said sleeve and having friction-heads surrounding the enlarged portion of the said shaft, a spring-coupler secured to the end of the reduced portion of the shaft of the blank-cylinder and adapted when the shafts come together in line to pass over the end of the shaft *a* in coupling the shafts together, and ring-springs within the sleeve of the blank-cylinder and around the friction-hubs of the heads to insure the frictional action between the same and the shaft, substantially as set forth.

9. In a machine for reproducing phonograph and similar records, the combination with shafts in line and sleeves thereon for the record and blank cylinders, of the recording and reproducing styles, arms upon which the said styles are mounted, supports therefor, a connecting-bar extending parallel with the axis of the shafts and between the supports of the styles, connections between the arms of the styles and the said bar, together with weights and springs for actuating the said styles and their arms to exert a pressure to insure the operation of the said styles, substantially as set forth.

10. In a machine for reproducing phonograph and similar records, the combination with shafts in line and sleeves mounted thereon for the record and blank cylinders, of a bar *k* and a support therefor, heads connected to the said bar and adjustably spaced apart, carrier-arms pivoted to the said heads, recording and reproducing styles and arms supporting the same and pivoted to the said carrier-arms, a connecting-bar and pivots therefor and means substantially as specified for connecting the said bar with the arms of the recording and reproducing styles and for applying a spring action and a weight thereto, substantially as set forth.

11. In a machine for reproducing phono-

graph and similar records, the combination with shafts in line and sleeves mounted thereon for the record and blank cylinders, of a bar *k* and a support therefor, heads connected
 5 to the said bar and adjustably spaced apart, carrier-arms pivoted to the said heads, recording and reproducing styles and arms supporting the same and pivoted to the said carrier-arms, a connecting-bar and pivots therefor,
 10 and means substantially as specified for connecting the said bar with the arms of the recording and reproducing styles, and for applying a spring action and a weight thereto, and a guide *r* adjacent to the reproducing-
 15 style and adjustably supported by the carrier-arm of the said style, substantially as set forth.

12. In a machine for reproducing phonograph and similar records, the combination
 20 with shafts in line and sleeves mounted thereon for the record and blank cylinders, of a bar *k* and a support therefor, heads connected to the said bar and adjustably spaced apart, carrier-arms pivoted to the said heads, recording and reproducing styles and arms supporting the same and pivoted to the said carrier-arms, the connecting-bar 8 pivoted to the said carrier-arms and extending across between the one and the other and to which the arms
 25 of the recording and reproducing styles are connected, threaded bars projecting from the carrier-arms and having weights movable thereon, an arm secured to the connecting-bar at about the center thereof, and spring

devices acting in connection with the weights 35 for producing a pressure upon the said styles, substantially as set forth.

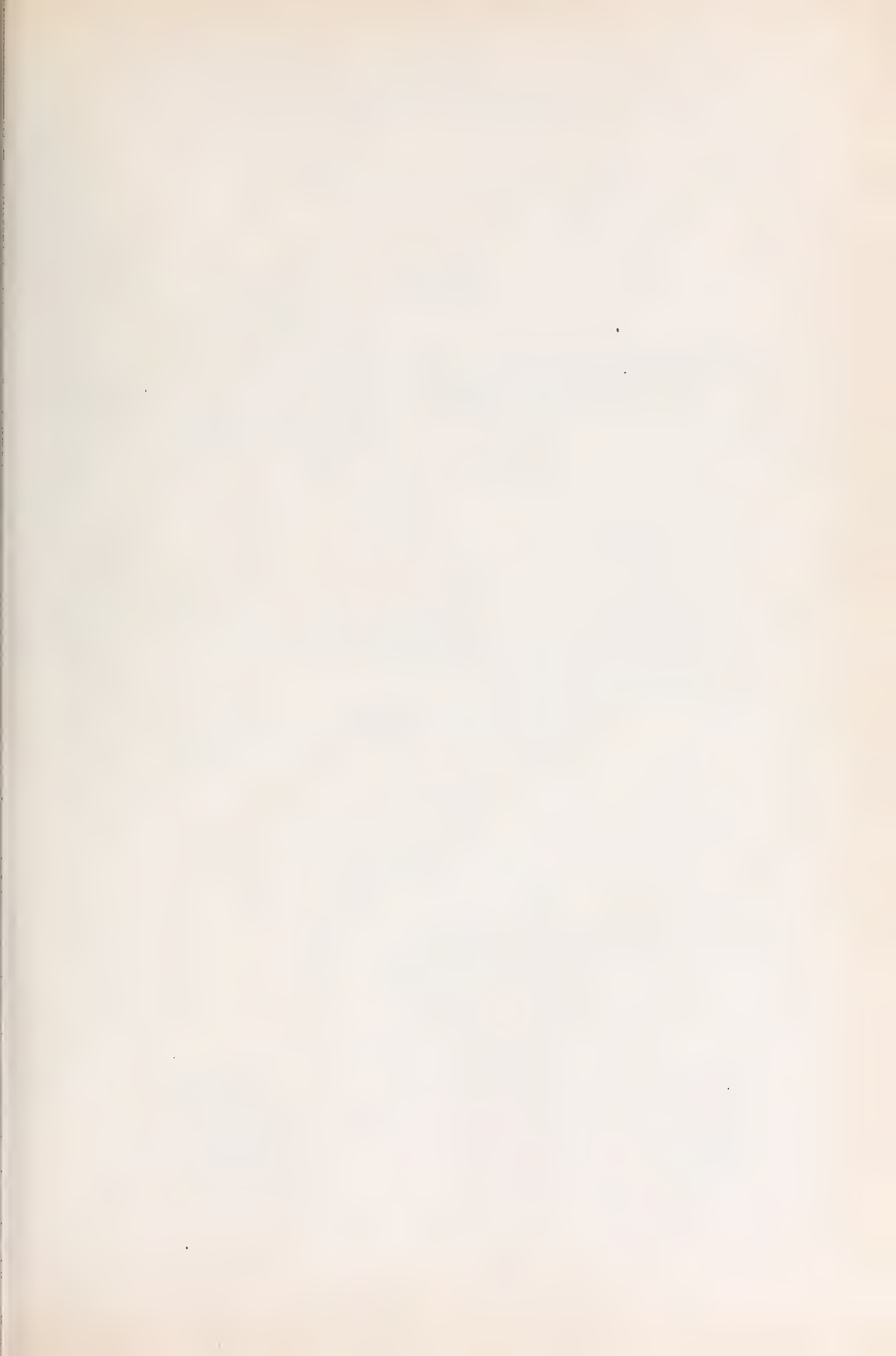
13. In a machine for reproducing phonograph and similar records, the combination
 40 with shafts in line and sleeves mounted thereon for the record and blank cylinders, of a bar *k* and a support therefor, heads connected to the said bar and adjustably spaced apart, carrier-arms pivoted to the said heads, recording and reproducing styles and arms supporting the same and pivoted to the said carrier-arms, the connecting-bar 8 pivoted to the said carrier-arms and extending across between the one and the other and to which the arms
 45 of the recording and reproducing styles are connected, threaded bars projecting from the carrier-arms and having weights movable thereon, an arm secured to the connecting-bar at about the center thereof, and spring
 50 devices acting in connection with the weights for producing a pressure upon the said styles, a clip 28 around and frictionally engaging the arm *k*, and a spring 29 extending therefrom to the end of the aforesaid arm and springs
 55 31 connected at one end to the carrier-arms, and at the other ends to the ends of the arms carrying the recording and reproducing styles, substantially as set forth.

Signed by me this 12th day of March, 1900.

ADEMOR N. PETIT.

Witnesses:

GEO. T. PINCKNEY,
 S. T. HAVILAND.



No. 663,011.

Patented Dec. 4, 1900.

J. R. CHALLEN, JR.

HORN FOR USE ON TALKING MACHINES.

(Application filed June 7, 1900.)

(No Model.)

Fig. 1.

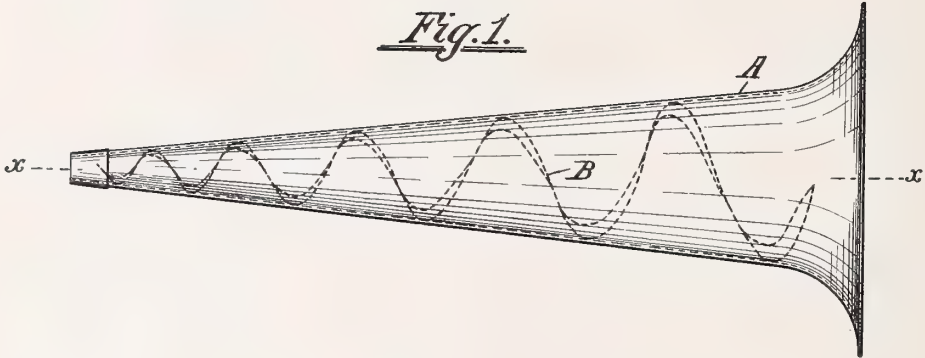


Fig. 2.

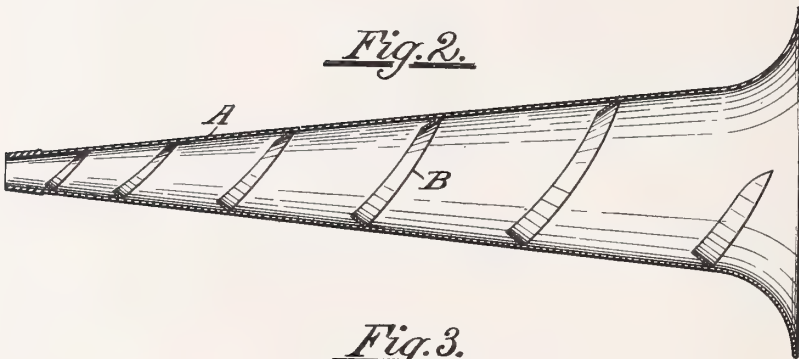
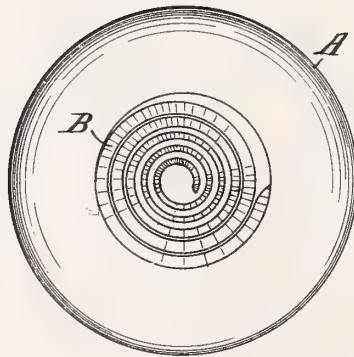


Fig. 3.



WITNESSES:

J. Fred Wherry
[Signature]

INVENTOR

James R. Challen Jr.
BY
Fred C. Fischer.
ATTORNEY.

UNITED STATES PATENT OFFICE.

JAMES R. CHALLEN, JR., OF NEWARK, NEW JERSEY.

HORN FOR USE ON TALKING-MACHINES.

SPECIFICATION forming part of Letters Patent No. 663,011, dated December 4, 1900.

Application filed June 7, 1900. Serial No. 19,361. (No model.)

To all whom it may concern:

Be it known that I, JAMES R. CHALLEN, Jr., a citizen of the United States, residing in Newark, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Horns for Receiving and Delivering Sound; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

My invention relates to improvements in horns for use in receiving and concentrating sound and for delivering and amplifying sound, and is particularly applicable to recording and reproducing horns on talking-machines.

The object of my invention is the controlling of sound-waves by means of a concentric spiral spine or rib which projects from the inside of the recording-horn and extends spirally from the smaller to the larger end thereof. By this device the direct sound-waves are caught at the orifice of the horn and instead of being deflected by the internal surface of the same at the usual angles which govern sound-waves the sound-waves are given a circular or spiral direction, being deflected by the incline of the spiral, and strike the diaphragm with a concentrated force. Furthermore, it appears that the projecting spiral rib by controlling the sound-waves also eradicates the tendency to produce overtones and causes the material of which the recording-horn is made to vibrate, and thus reinforces the volume of sound.

The horn for delivering and amplifying sound is dependent upon exactly the same feature for its improved action—that is to say, when in use upon a talking-machine the sound-waves leave the diaphragm and strike the spiral rib which projects from the inside of the horn, thereby giving it direction and causing the entire horn to vibrate, thus greatly increasing the volume of the reproduction and making it clear and natural.

In the accompanying drawings, Figure 1 is a longitudinal view of a horn, in which my improvement is shown in dotted lines. Fig.

2 is a sectional view of a horn cut through on the lines *xx* in Fig. 1; and Fig. 3 is an end view of a horn, showing my concentric spiral improvement.

In describing my improvement I shall call attention to the accompanying drawings, where like letters of reference indicate corresponding parts in the different views of the same.

A indicates the horn. The material of which it is made is not essential to specify, inasmuch as different materials can be used to advantage. B is a concentric spiral rib attached to the inner walls thereof and extending from the smaller to the larger end and increasing in width proportionately to the increase in diameter of the horn and inclined at an angle toward the smaller end. The rib B might be made of uniform width throughout its length and inclined at any angle without departing from the spirit of my invention.

The horn, with its concentric spiral rib B, is preferably made of brass, although it is evident that other well-known materials, such as papier-mâché, metal, celluloid, &c., might be substituted.

I have specified that the invention is particularly applicable to talking-machines, and it will therefore be obvious that this device is applicable to any instrument in which sound is received or delivered, so as to concentrate or amplify the sound.

It will of course be very evident in reviewing the very simple means used in my invention that in view of the very simple elements combined for the above-stated purpose I cannot and will not positively tie myself down to having the spiral rib attached on the inside of the horn, inasmuch as the "spiral" flange, as it might also be called, could in some suitable mechanical manner so pierce the side of the horn as to appear on the outside. The scientific reasons for that idea I cannot at the present time state, confining myself merely to suggesting that from a mechanical material point of view such a construction is possible. I furthermore do not limit myself to any definite shape of the horn, as the inventive merit of my sound theory as stated in my preamble will hold good just as well with a horn that is curved as with one that is shown straight, as in the drawings.

What I consequently claim in accordance

with the above description, and desire to secure protection for by Letters Patent, is, broadly—

- 5 1. The combination with a horn-shaped device for receiving and concentrating sound, of a concentric spiral rib or flange attached to the inner walls thereof extending from the larger to the smaller diameters thereof, substantially as described.
- 10 2. The combination with a sound-horn of a concentric spiral rib or flange attached to the inner walls thereof, extending from the smaller to the larger diameters of the said horn for the purposes described.
- 15 3. The combination with a sound-horn, of a concentric spiral rib or flange attached to the inner walls thereof, extending from the smaller to the larger end and increasing in width proportionately to the smaller and
20 larger diameters of the said horn, substantially as and for the purposes described.
4. In a horn for delivering and amplifying sound, a concentric spiral rib or flange at-

tached to the inner walls thereof, and extending from the smaller to the larger end, increasing in width proportionately to the increase in diameter of the horn and inclined at an angle toward the smaller end, substantially as described and for the purposes set forth. 25

5. The combination in a recording and reproducing sound-horn for phonetic purposes, of a concentric spiral rib or flange attached to the inner walls thereof, said flange increasing in width proportionately with the minimum and maximum diameters of the horn, and inclined at an angle toward the sides of the said horn, substantially as and for the purposes described. 30

In testimony that I claim the foregoing I have hereunto set my hand this 2d day of June, A. D. 1900. 35

JAMES R. CHALLEN, JR.

Witnesses:

FREDK. C. FISCHER,
HARRY G. WALTERS.

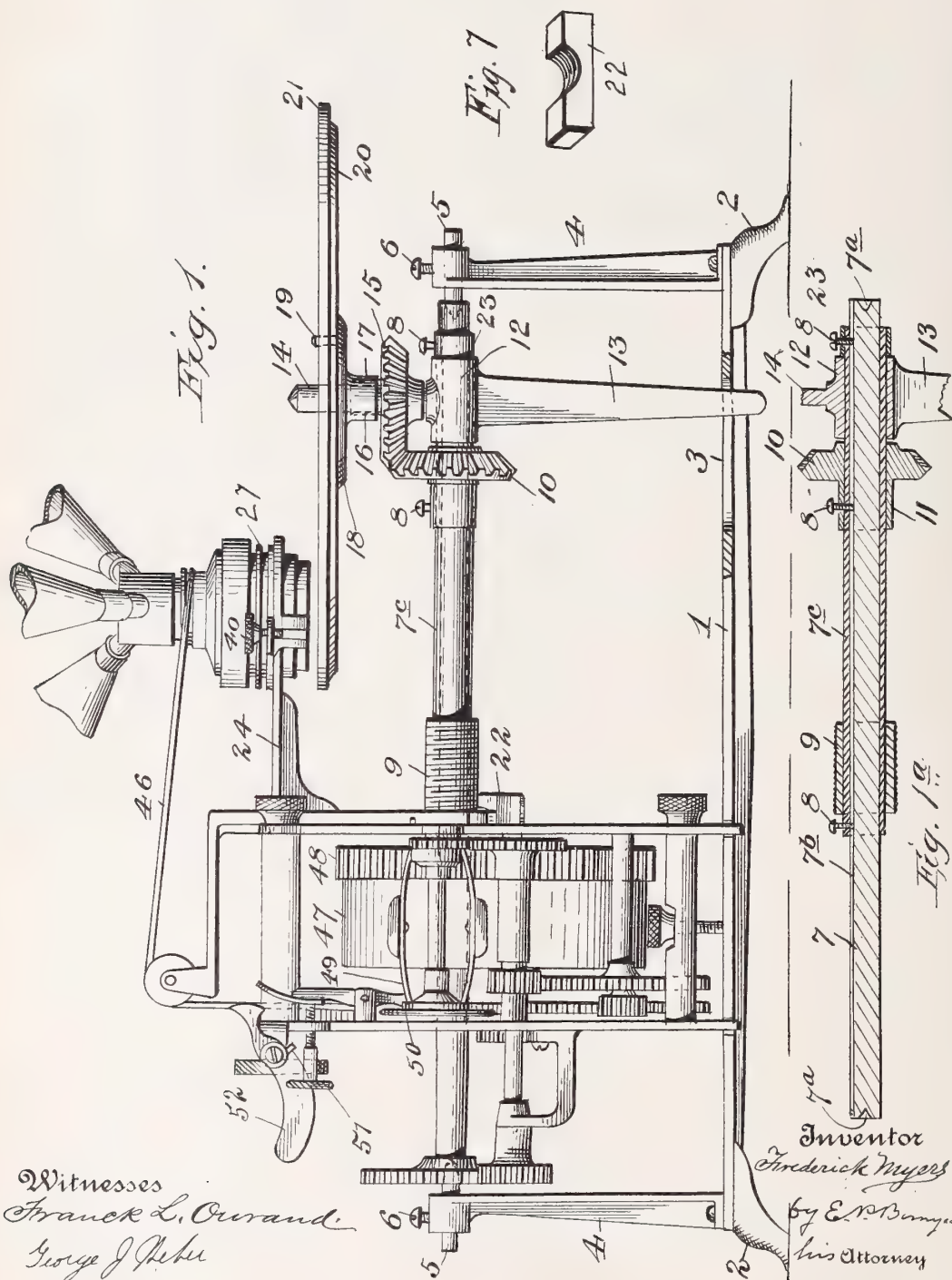
F. MYERS.

SOUND RECORDING AND REPRODUCING INSTRUMENT.

(Application filed Aug. 1, 1900.)

(No Model.)

2 Sheets—Sheet 1.





F. MYERS.

SOUND RECORDING AND REPRODUCING INSTRUMENT.

(Application filed Aug. 1, 1900.)

(No Model.)

2 Sheets—Sheet 2.

Fig. 2.

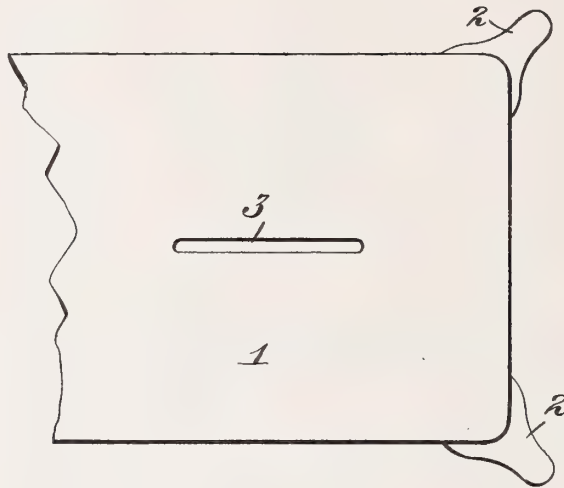


Fig. 3

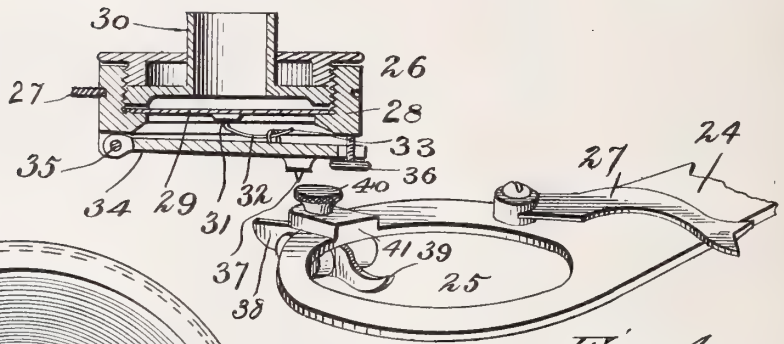


Fig. 5.

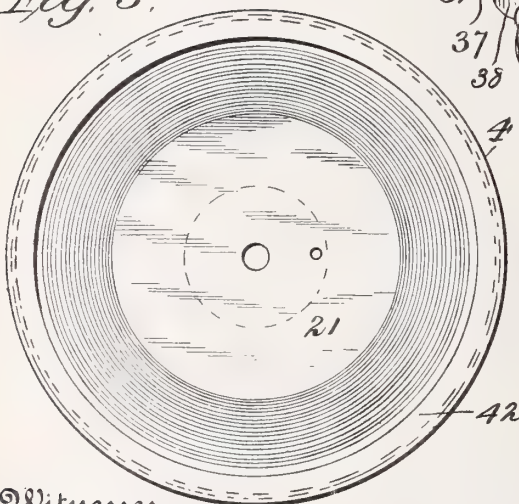


Fig. 4

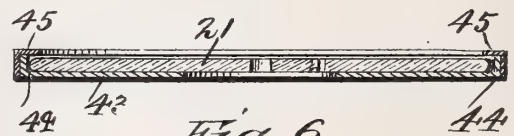


Fig. 6.

Witnesses
 Frank L. Owsand
 George J. Allen

Inventor
 Frederick Myers
 by E. R. Brunsen,
 his Attorney

UNITED STATES PATENT OFFICE.

FREDERICK MYERS, OF NEW YORK, N. Y., ASSIGNOR TO THE STYLOPHONE COMPANY, OF SAME PLACE.

SOUND RECORDING AND REPRODUCING INSTRUMENT.

SPECIFICATION forming part of Letters Patent No. 663,192, dated December 4, 1900.

Application filed August 1, 1900. Serial No. 25,549. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK MYERS, a citizen of the United States, residing at New York city, in the county of New York and State of New York, have invented certain new and useful Improvements in Sound Recording and Reproducing Instruments; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the figures of reference marked thereon, which form a part of this specification.

My invention relates to sound recording and reproducing instruments of the type designed to operate upon disk or tablet records; and the objects of the same are to provide reliable and efficient means for imparting simultaneous rotary motion and a lateral movement to the disk or tablet while the recorder or reproducer is held in a relatively stationary position, the stylus having only the necessary movement to record or traverse the grooves in the record. In the instruments of this type in common use a rotary motion is given to the disk, while the reproducer is mounted upon a pivoted arm and moves laterally across the face of the disk, the stylus being free to move laterally in conformity with the trend of the sound-grooves in the disk and having no positive movement imparted to it. Owing to the fact that the stylus is made to accomplish two widely-different functions—feed itself across the disk and reproduce the record—the wear upon the point is considerable, requiring constant renewals. By giving both movements required to the record any well-known type of reproducer or recorder may be used and far better results attained both in quality of reproduction and in wearing qualities. Thus also any well-known recorder may be used, as the two movements are given to a single part—viz., the disk or tablet record.

Another object of my invention is to provide a record disk or tablet with a protecting rim or casing. This rim or casing is designed to fit the outer periphery of the disk and to extend a slight distance over the opposite surfaces of said disk, so that said disks will not

come into contact with each other when packed for shipping, handling, or when not in use. This rim is intended to be left on the disk at all time, but is not connected thereto by adhesive material or otherwise. This protector may be made of a material somewhat more rigid in character than the disk in order that any slight torsion or warping of the disk would not result in fatal distortion or breakage.

Another object is to provide a simple and efficient sound-box for this class of instruments.

I attain the objects referred to by means of the construction illustrated in the accompanying drawings, in which—

Figure 1 is a front elevation of a sound-reproducing instrument made in accordance with my invention. Fig. 1^a is a longitudinal section of the feed-shaft and parts connected thereto. Fig. 2 is a detail or partial plan view of the table upon which the instrument is supported. Fig. 3 is a central vertical section of the sound-box. Fig. 4 is a detail perspective of a portion of the supporting-arm for the sound-box. Fig. 5 is a plan view of the record disk or tablet. Fig. 6 is a transverse vertical section thereof. Fig. 7 is a perspective view of the nut.

Like numerals of reference designate like parts wherever they occur in the different views of the drawings.

The numeral 1 designates a table or stand for supporting the instrument, and 2 indicates the legs for said table. A slot 3 is formed near one end in said table for a purpose which will hereinafter appear. Rising from the opposite ends of the table are the upright brackets 4 4, and passing through aligned apertures in these brackets are the adjustable centers 5 5, held in adjustable positions by the set-screws 6 6. The feed-shaft 7 is provided with a conical recess 7^a in each end, and the pointed ends of the centers 5 fit these recesses and reduce the friction of the bearing on said shaft. A longitudinal groove 7^b extends from end to end of the shaft 7, and a sleeve 7^c surrounds said shaft and revolves with it, the set-screws 8 passing through the sleeve and their ends entering the groove 7^b. The feed-screw 9 is tubular in form and is

firmly secured to the sleeve 7^c by shrinking or in any suitable way. A bevel-gear 10, provided with a tubular hub 11, is held to the sleeve 7^c and to the shaft 7 by one of the set-screws 8, and a collar 12 is loosely journaled on the sleeve 7^c and has a guide-arm 13 projecting centrally from its under face and having its lower end fitted to slide in slot 3 in the table. Formed on or secured to said collar upon its upper surface is a spindle 14, and journaled on said spindle is a bevel-gear 15, which meshes with the bevel-gear 10. A collar 16, formed integrally with the bevel-gear 15, projects upward to fit tightly within a hub 17 of a face-plate 18. A pin 19 projects upward from the face-plate 18 through a bed-plate 20. The record-disk 21 has a central aperture which fits the spindle 14 and a hole through which the pin 19 projects. The record is thus revolved by the bevel-gear 15. A nut 22, which is of the usual construction for this purpose, fits up against the feed-screw 9 and may be provided with the usual means for disconnecting it from said feed-screw, so that the sleeve 7^c and all the parts carried thereby may be moved on the shaft 7, as is necessary at starting the instrument. A ring or collar 23, held in place on the sleeve 7^c by one of the set-screws 8, prevents the collar 12 from sliding on said sleeve.

As thus far described, it will be understood that as the shaft 7 is revolved it rotates the sleeve 7^c and with it the bevel-gear 10. The nut 22 when in contact with the feed-screw 9 moves the sleeve 7^c and the record-disk 21 horizontally inward on the shaft 7. When the nut 22 reaches the end of the feed-screw, the horizontal feed is stopped, as will be understood. The record-disk is thus given the two movements necessary—viz., a rotary motion on its axis and a gradual horizontal movement, depending upon the pitch of the feed-screw 9. The slot 3 and the guide-arm 13 hold the record-disk in a horizontal plane and at the same time permit a free movement of the record-disk when the nut 22 has been thrown out of contact with the feed-screw 9. By giving these two movements to the record-disk I am enabled to use a stationary recorder or reproducer, and I provide a bracket 24, which projects over the record in position to carry the recorder or reproducer. In the outer end of the bracket 24 an aperture 25, Fig. 4, is formed, and properly seated in this aperture is the sound-box 26. A pivoted catch 27 on the bracket 24 serves to securely hold the sound-box in place in the aperture 25. The catch 27 may be swung up against the sound-box to hold it in place and may be swung outward to release said sound-box when it is desired to remove it.

The sound-box 26 comprises a casing 28, having a diaphragm 29 seated therein and a horn-nipple 30 superposed above said diaphragm. Secured centrally under the diaphragm is a sounder 31, consisting of a button connected to said diaphragm in any suit-

able manner, and a spring-shank 32 is secured to said button and curved outward from said button, the free end of said spring passing through a staple or keeper 33 upon the upper face of a weighted stylus arm or disk 34. This stylus arm or disk is pivoted at 35 to the casing 28, and at its opposite end the arm or disk is slotted to accommodate a set-screw 36, which serves to raise and lower the arm or disk 34 to set the stylus to the required height. The stylus 37 is firmly secured to the arm or disk 34. A lever 38, pivoted at the side of the aperture 25 of the bracket 24, is provided with a toe 39, which may be thrown up by a thumb-screw 40 to hold the arm or disk up to throw the stylus out of contact with the record. The boss or projection 41 is designed to form a bearing for the thumb-screw 40.

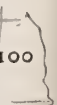
As shown in Figs. 5 and 6, the record-disk 21 has a protector 42 surrounding its periphery. This protector may be formed of papier-mâché, vulcanite, or thin sheet metal and consists of a bottom casing 43, having an up-turned rim 44 and an upper cover or binding which fits snugly upon the rim 44 and has a projecting upper portion 45. The two parts of the protector hold the record-disk firmly between them, but are not secured to said disk in any manner. The protector is not removed from the disk when the latter is placed on the instrument; but if it is desired to have a record upon both sides of the disk the latter may be taken out of the protector and inverted. For the purpose of projecting the sound radially from the instrument I may mount a plurality of horns on the nipple 30 and revolve them during the operation of the instrument by a band or cord 46, suitably connected to a pulley driven by the motor.

The motor may be of any suitable kind, that shown being a spring-motor. The barrel 47 contains a spring of suitable length and gage, and upon one edge of the barrel a spur-gear 48 is formed or attached. This gear is connected to a suitable train of gears, which give the required rotary motion to the shaft 7. A governor 49 and a brake-disk 50 may be used to regulate the speed, the regulator-screw 51 serving to throw a brake-shoe against the disk 50, and a start-and-stop lever 52 bears against a lever to stop the motor and may be moved out of contact with said lever to start said motor.

By means of my construction the ordinary disk records may be reproduced by a recorder of ordinary construction. In view of the fact that but little space is required to pack and care for the disk records they have become quite desirable, and when protected from injury by a casing or rim such as I have described one of the principal objections to their use is overcome.

Having thus fully described my invention, what I claim is—

1. A disk record having a protector applied to the periphery thereof.



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2. A disk record for sound-reproducing instruments having a protector which envelops the periphery of said disk, said protector consisting of a two-part casing, one fitting with-
5 in the other.
3. A protector for record-disks, consisting of a two-part casing, one of said parts inclosing the disk record, and the other part fitting over both the disk and the casing.
- 10 4. A sound-box consisting of a casing, a diaphragm therein, a button secured to the diaphragm and having a spring-shank, and a weighted stylus-lever having a keeper through which the spring-shank of the button freely extends.
- 15 5. A sound-box comprising a diaphragm, a button secured to said diaphragm and provided with a curved spring, a lever having a stylus rigidly connected thereto, and a keeper on said stylus-lever through which the spring
20 extends.
6. In a sound-reproducing instrument, a record-disk, and means to simultaneously revolve and move it laterally, in combination with a rigid bracket having an aperture in
25 its outer end and a sound-box seated in said aperture.
- In testimony whereof I affix my signature in presence of two witnesses.
- FREDERICK MYERS.
- Witnesses:
F. L. OURAND,
GEORGE J. WEBER.

No. 663,193.

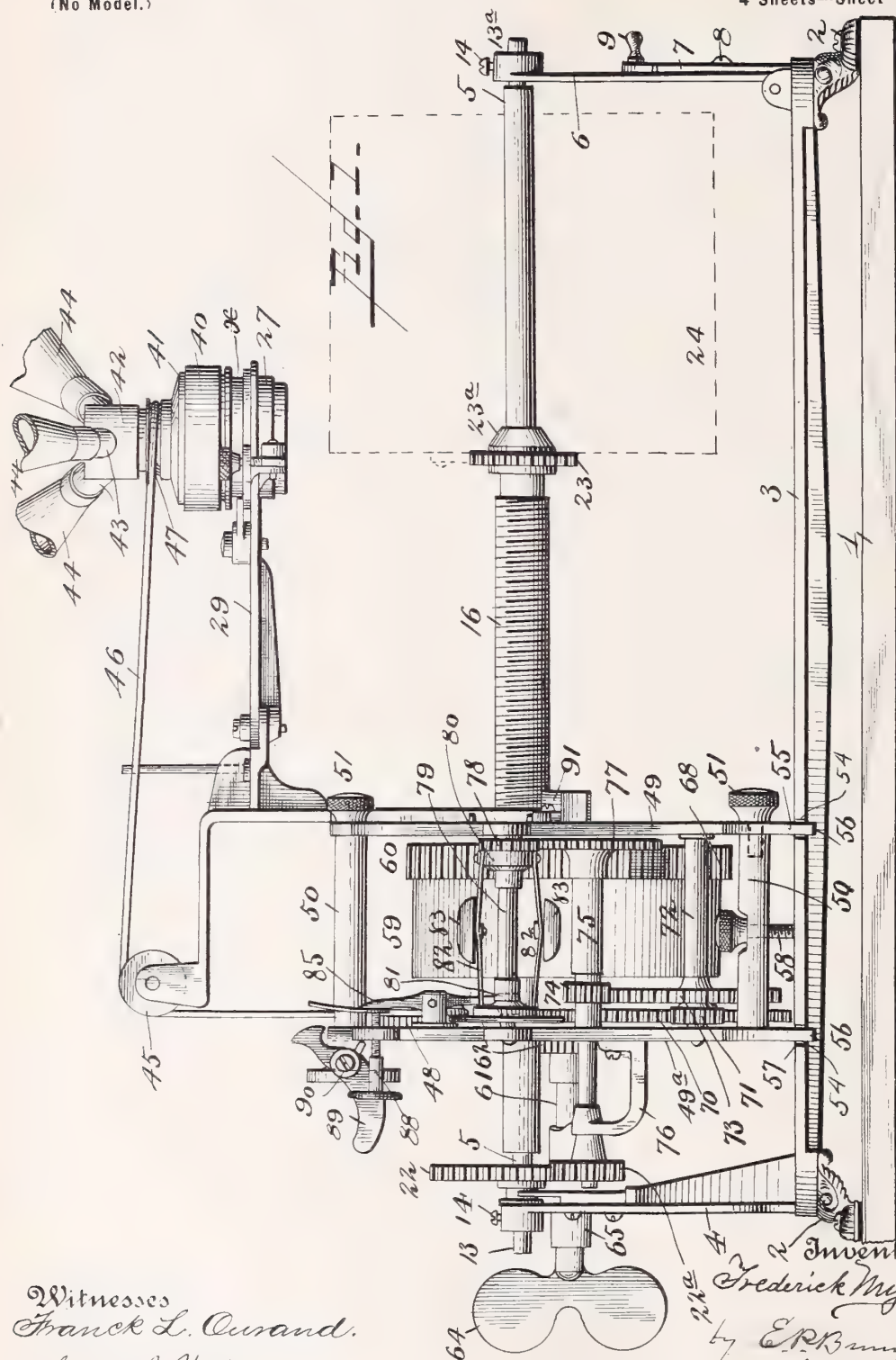
Patented Dec. 4, 1900.

F. MYERS.
PHONOGRAPH.

(Application filed Aug. 1, 1900.)

(No Model.)

4 Sheets—Sheet 1.



Witnesses
Frank L. Curand.
George J. Weber

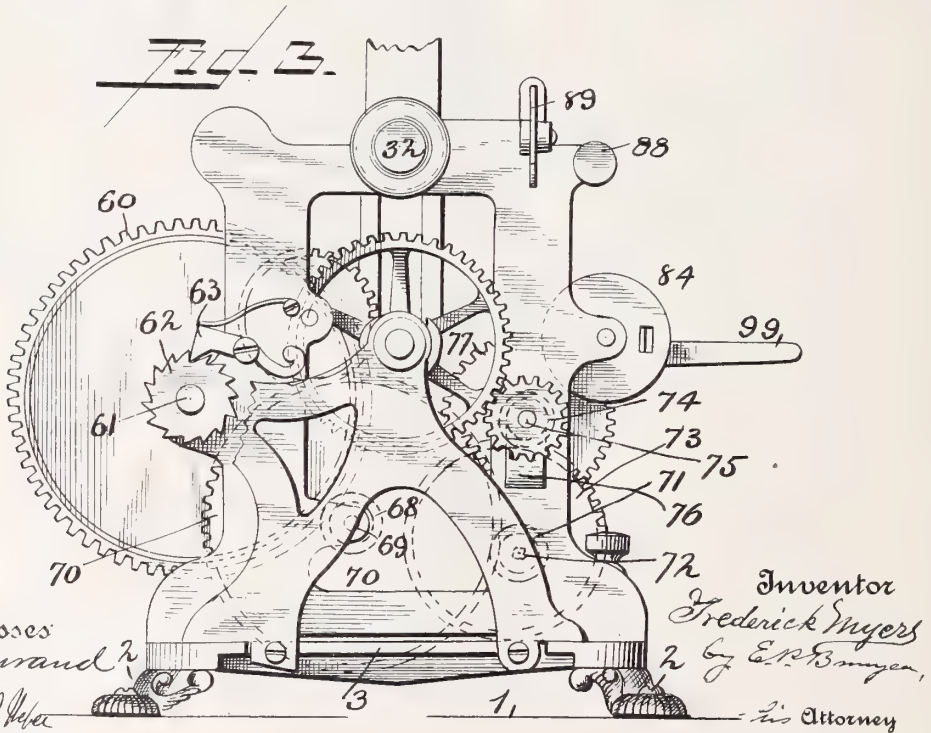
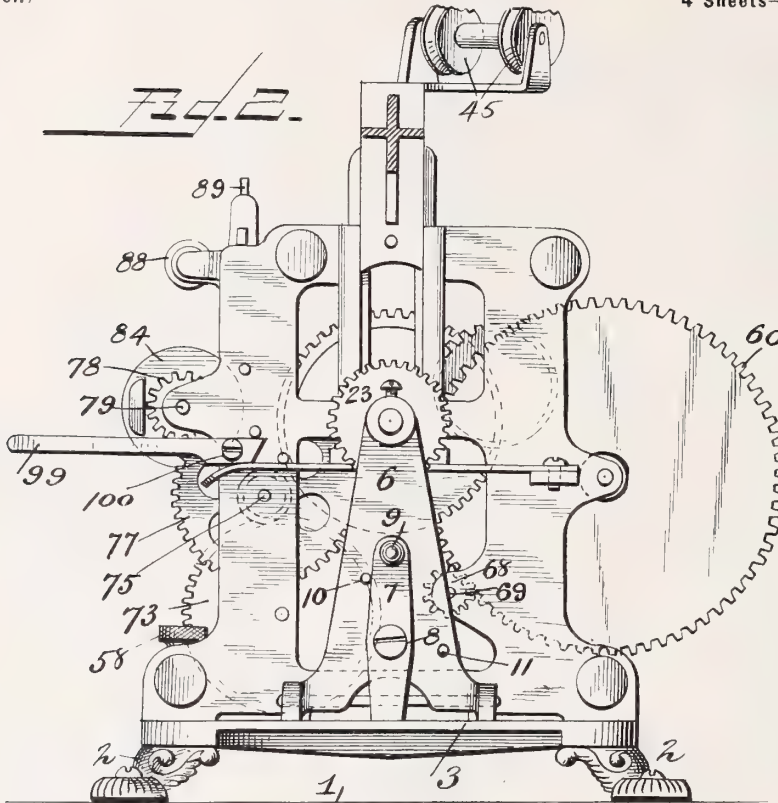
Inventor
Frederick Myers
by E. R. Bringer
his Attorney

F. MYERS.
PHONOGRAPH.

(Application filed Aug. 1, 1900.)

(No Model.)

4 Sheets—Sheet 2.

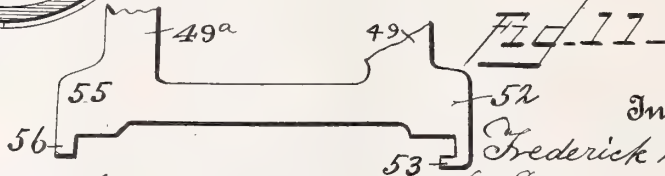
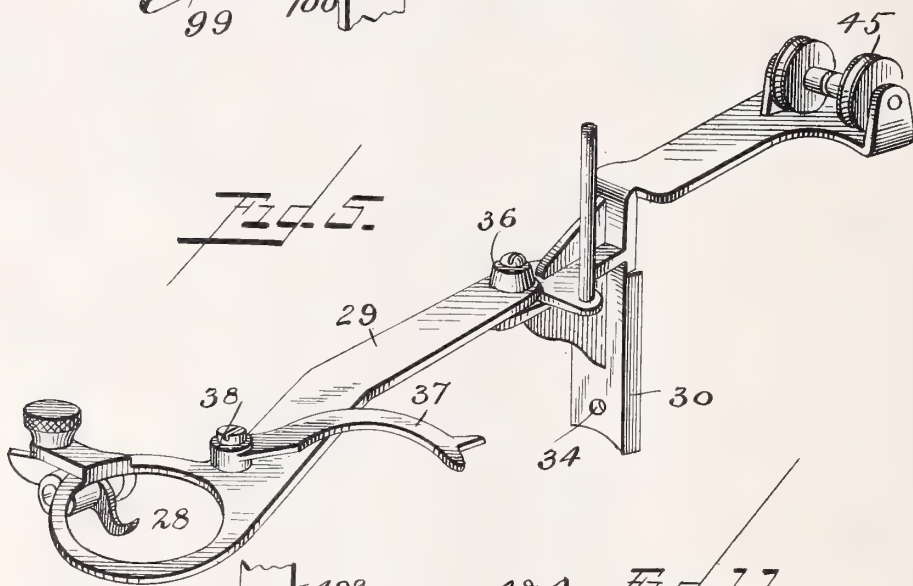
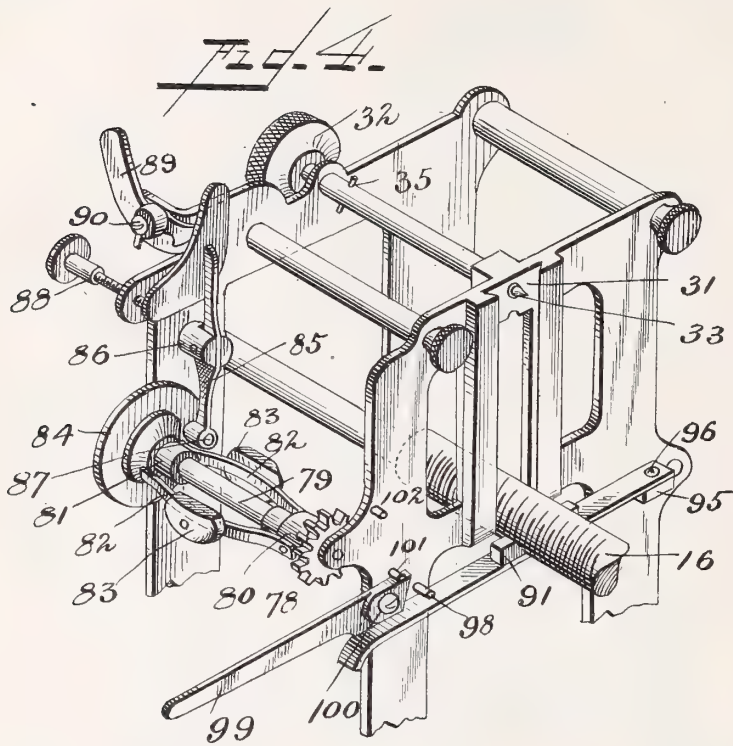


F. MYERS.
PHONOGRAPH.

(Application filed Aug. 1, 1900.)

(No Model.)

4 Sheets—Sheet 3.



Witnesses
Fraucl L. Ourand.
George H. H. H.

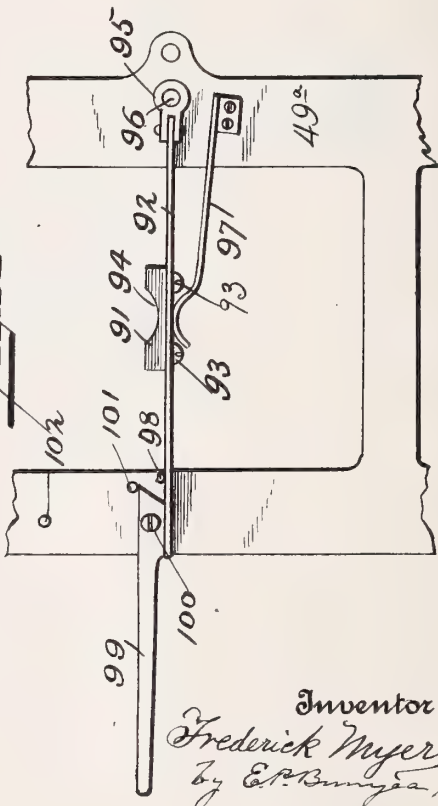
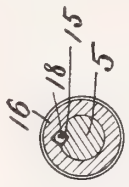
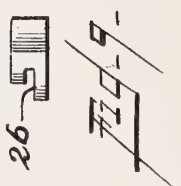
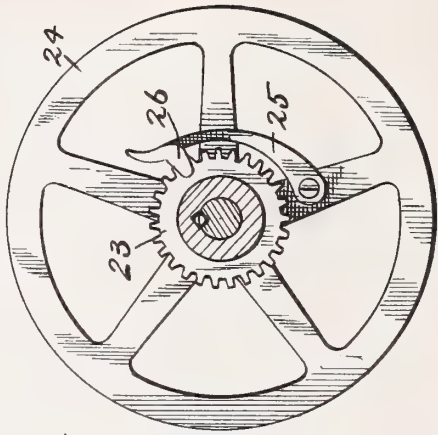
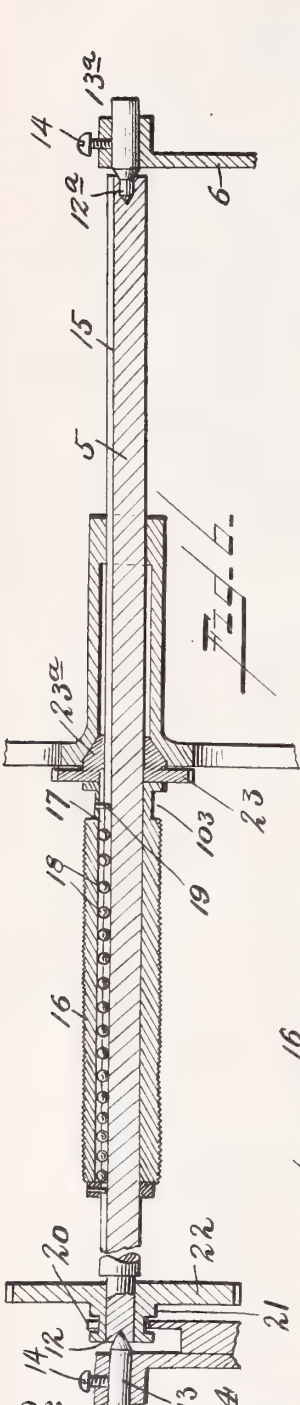
Inventor
Frederick Myers
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F. MYERS.
PHONOGRAPH.

(Application filed Aug. 1, 1900.)

(No Model.)

4 Sheets—Sheet 4.



Witnesses
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George J. Pike

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his Attorney

UNITED STATES PATENT OFFICE.

FREDERICK MYERS, OF NEW YORK, N. Y., ASSIGNOR TO THE STYLOPHONE COMPANY, OF SAME PLACE.

PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 663,193, dated December 4, 1900.

Application filed August 1, 1900. Serial No. 25,550. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK MYERS, a citizen of the United States, residing at New York city, in the county of New York and State of New York, have invented certain new and useful Improvements in Phonographs; and I do declare the following to be a full, clear, and exact description of the invention, such as it appertains to make and use the same, reference being had to the accompanying drawings, and to the figures of reference marked thereon, which form a part of this specification.

My present invention relates to sound-reproducing instruments of the phonograph type; and one of the objects of the same is to provide reliable and efficient means for giving both a rotary motion and a lateral feed to the record, whether said record be upon a tube or disk, while the reproducing or recording stylus is held in a relatively stationary position. In instruments of this character as usually constructed the reproducing or recording stylus is fed laterally across the face of a record tube or disk and a plain rotary motion is imparted to the record tube or disk. If the best results are to be attained, these two distinct motions of the two parts referred to must be relatively determined and uniformly maintained by both the producing and reproducing instruments, as the slightest variation in relative speed gives an imperfect reproduction. There are many advantages arising from a construction which embodies the feature referred to of giving the two necessary movements to one part of the machine instead of two movements to two different parts.

Another object of my invention is to provide means for adjusting the recording-stylus or the sound-box toward and away from the record tube or disk, and the range of this adjustment is sufficient to produce or reproduce records on tubes or disks of different sizes or diameters. By means of this feature of my invention any of the records to be found on the market, whether the diameter be large or small and whether tubular in form or of the disk or tablet shape, can be reproduced on the instrument with but slight and quick

adjustment. Records can also be produced in either the disk or tubular form by use of the instrument and a suitable recorder.

Another object of my invention is to provide means whereby the sound is directed centrally upward from the sound-box and radially outward from the instrument. The advantage gained by this feature of my invention is that none of the vibrations from the record are distorted or absorbed by reflecting surfaces, and a more direct and perfect reproduction is attained.

Another object is to provide means for removing the tubular record and its supporting drum or cylinder together from the instrument in order that said record may be properly placed in its box or case and the drum then withdrawn and inserted in another record to be placed upon the instrument. This feature of my invention obviates direct handling of the fragile records without a protecting-support.

Still another object is to simplify the construction and reduce the weight of instruments of this character.

In the accompanying drawings, which form a part of this specification, Figure 1 is a front elevation of an instrument embodying my invention. Fig. 2 is an end elevation. Fig. 3 is an end elevation looking at the opposite end from that shown in Fig. 2. Fig. 4 is a perspective view of the governor and brake. Fig. 5 is a perspective view of the arm for supporting the sound-box. Fig. 6 is a longitudinal section of the record-shaft. Fig. 7 is a cross-section of the same. Fig. 8 is a detail view of the latch for holding the record-drum to the feed-screw. Fig. 9 is an end view of the latch. Fig. 10 is a side view of the nut for feeding the feed-screw and the means for connecting it to the frame of the machine. Fig. 11 is a detail view of the feet of one of the motor-supports.

Like numerals of reference designate like parts wherever they occur in the different views of the drawings.

As shown in said drawings, the instrument rests upon a table 1 and is supported upon legs 2 at the corners of a horizontal frame 3. A bracket 4, rising from one end of the frame 3, serves as a support for one end of the rec-

ord-shaft 5, the opposite end of said shaft being supported in a bracket 6, hinged at its lower end to the frame 3 and held in an upright position by means of a pivoted lever 7.

5 This lever is pivoted at 8 to the bracket 6 and has a knob or handle 9 for turning it. When the lever is turned to a vertical position, its lower end bears upon the upper surface of the frame 3 and holds the bracket 6 in an upright position, and when said lever is turned
10 down against the stop-pin 11 the bracket 6 may be swung down on its hinge, leaving that end of the record-shaft free for the removal of the record-drum or record, and vice versa,
15 and for the attachment of another record, as will be hereinafter explained. A stop-pin 10 serves to limit the pivotal movement of the lever 7 in one direction. The record-shaft 5 is recessed at its opposite ends, as at 12 12^a,
20 and adjustable centers 13 13^a are held in the brackets 4 and 6 by set-screws 14, the points of said centers engaging the recesses 12 12^a to form antifrictional bearings for said shaft. The record-shaft has a longitudinal groove extending from end to end thereof to form a ball-
25 race 15 for the lateral movement of the feed-screw. The feed-screw 16 is tubular in form and is provided interiorly with a longitudinal groove 17, which forms the other half of ball-race 15. The balls 18 are held in the
30 groove 17 in the feed-screw by stop-pins 19 near the opposite ends of said feed-screw and projecting into the groove. To prevent the record-shaft from endwise withdrawal when
35 the bracket 6 is swung down and in removing the record-drum and its record, a yoke 20 is formed on or secured to the bracket 4, and this yoke spans a groove formed in the hub 21 of a gear-wheel 22, keyed to the record-shaft. This yoke does not normally bear
40 within the groove in the hub 21, but merely prevents the endwise withdrawal of said record-shaft by coming in contact with the opposite walls of the groove. The tubular feed-screw 16 has a notched disk 23 secured to its
45 outer end, and the removable record-drum 24 may be connected to and disconnected from this disk by a latch 25, pivoted to the drum 24 and provided with a bifurcated lip 26, adapted to engage any of the notches in the wheel 23 and the sides of said disk. The record-drum
50 is thus locked to the feed-screw and revolves and moves laterally with it. A cone 23^a, formed as a hub of the disk 23, fits a conical aperture in the end of the record-drum.

The sound-box 27 is mounted within the apertured end 28 of an arm 29, projecting horizontally outward from the motor-frame. A vertical member 30 of the arm 29 fits a dovetail
60 guideway 31 on the side of the motor-frame, and by adjusting the member 30 in the guideway 31 the sound-box may be given any desired position relatively to large or small records or tubular or disk records. When in its
65 uppermost position, it is held in place by a rod having a milled head 32 extending across the motor-frame and having a reduced end 33,

which fits an opening 34 in the vertical member 30. When this rod is withdrawn as far
as the stop-pin 35 will permit, the sound-box-
70 supporting arm 29 may be pushed down and the vertical member 30 depressed in the guideway 31 for work upon small records. In order that the arm 29 may be swung laterally out
75 of the way when desired, said arm may be pivoted or hinged, as at 36. Any suitable sound-box may be used and may be held in the aperture 28 of the arm 29 by a catch 37,
80 pivoted at 38 to the arm and fitting a groove *x*, Fig. 1, in the side of the sound-box. Suitably mounted upon the sound-box is a ball-cup 40 of ordinary construction, and resting upon the balls in the cup is a ball-cone 41,
85 also of ordinary construction, formed as a part of the base portion of the horn-bracket 42, the latter having a plurality of nipples 43 projecting radially in an inclined direction therefrom. Each nipple 43 has a horn 44 connected thereto. A bracket formed on the
90 sound-box arm 29 has a pair of idlers 45, loosely journaled thereon, and a belt or band 46, preferably of rubber, passes around a groove 47, formed in the horn-bracket, over the idlers 45, and down around a grooved
95 gear-wheel 48, journaled by its stub-shaft in one part of the motor-frame.

The motor for running the instrument may be of any suitable form, the one shown being of the spring type. The two upright supports 49 49^a, forming the motor-frame, are
100 held apart by tie rods or braces 50, all rigidly secured to one of the upright supports 49^a and detachably secured to the other support 49 by the screw-buttons 51, which pass through
105 apertures in the upright 49 and into threaded sockets in the braces 50. The lower ends of the supports 49 49^a are provided with means for ready attachment to and detachment from the frame 3. As shown, the legs 52 are provided with projecting lips 53, which pass into
110 recesses 54 in the rear portion of the frame 3, and when the motor-frame is moved to the front these lips engage under the frame-bars beyond the recesses 54. The legs 55 on the
115 motor-frame have toes 56, which fit the recesses 57 in the frame 3, and when in place a thumb-screw 58, passing through one of the tie rods or braces 50, enters a threaded aperture in the frame 3 and holds the motor-frame firmly in place on the frame 3 and permits its
120 ready detachment and disconnection therefrom. The spring-barrel 59 contains a spring of suitable length and gage, and upon one edge of the barrel 59 a spur-gear rim 60 is formed or attached. A shaft 61 passes centrally through the barrel 59, and this shaft is
125 journaled in the supports 49 49^a. A ratchet-wheel 62 is fixed to the shaft 61, and a pawl 63 engages said ratchet-wheel. The outer end of the shaft 61 projects into an opening in the bracket 4, and a key 64 has a tubular shank
130 65, which fits the end of said shaft and fills the opening in the bracket 4. The spur-gear 60 meshes with a pinion 68, fixed to a shaft 69,

journaled in the motor-frame, and a large gear-wheel 70 is secured near the opposite end of said shaft 69. The wheel 70 is in mesh with a pinion 71, keyed to shaft 72, journaled in the motor-frame. A gear-wheel 73 on shaft 72 engages a pinion 74 on a shaft 75, said shaft being journaled in the motor-frame and projecting beyond the frame at one end, where it is supported in a bracket 76. The shaft 75 has a gear-wheel 77 keyed to it, which engages a pinion 78 on the governor-shaft 79. On the outer end of said shaft 75 a pinion 22^a is fitted, which meshes with the gear-wheel 22 on the record-shaft 5. The governor comprises a shaft 79, having a fixed hub 80 and a sliding hub 81 mounted thereon. Flat springs 82 are secured at their opposite ends to the fixed hub and the sliding hub, and weights 83 are secured centrally to the springs. A brake-disk 84 is secured to the shaft 79 and may be formed integrally with the sliding hub 81. A brake-lever 85 is pivoted at 86 to the motor-frame, and at its lower end this lever carries a leather brake-shoe 87, which may be pressed against the disk 84 with more or less force by a regulating-screw 88, fitted into a threaded hole in the upright support 49^a. The speed of the record-shaft may be instantly varied by turning the screw 88. To start or stop the instrument when the motor has been wound up, a lever 89, pivoted at 90 to the support 49^a, is moved to bear against the upper arm of the brake-lever 85 or to release it.

The nut 91 of the usual construction, which serves to feed the record-screw laterally, is secured to a bar 92 by screws 93. The nut 91 is threaded in the concave portion 94 to fit the threads of the feed-screw 16. The bar 92 has secured to one of its ends an eye 95, pivoted at 96 to the support 49^a, and the nut is held up into engagement with the feed-screw 16, when desired, by a spring 97, secured at one end to the support 49^a, and its free end bearing upward under the bar 92, immediately under the nut 91. A stop-pin 98 limits the upward movement of the bar 92, and a lever 99, pivoted at 100, serves to throw the bar 92 down to disconnect the nut 91 from contact with the feed-screw 16. Stop-pins 101 and 102 limit the movement of the lever 99.

The operation of my invention is as follows: When the motor has been wound up and a record has been placed upon the record-drum and the drum has been slipped upon the record-shaft 5, the bracket 6 is swung up and locked in place by the lever 7. The latch 25 is now engaged with the disk 25. The nut 91 is held out of contact with the feed-screw 16 by the lever 99, and hence the feed-screw and record-drum may slide freely on the record-shaft and be set at any point. The stylus-arm 29 may be swung out of the way while the record is being placed in the instrument, if desired. Starting from the left-hand end of the record in the position shown in Fig. 1

of the drawings, the stylus is brought into contact with the record and the motor is released, feeding the record to the left when the nut 91 has been thrown into contact with the feed-screw. The speed is regulated by the screw 88, and the governor insures a uniform and regular movement to all the operative mechanism. When the feed-screw has reached its limit of endwise movement, the nut 91 rests in the smooth recess 103 in the feed-screw and the feed is stopped.

From the foregoing it will be obvious that the arm 29 may be raised or lowered to bring the stylus into contact with tubular records of large or small diameters or disks of any thickness. Owing to the fact that the sound-box does not move across the face of the record-revolving horns may be mounted directly upon said sound-box, and hence do not require an elastic belt or band to revolve them. There are many advantages arising from the fact that all the movements necessary to produce or reproduce a record are given to but one part of the instrument—viz, the record-shaft, which carries with it the feed-screw and the record. The record-drum being readily slipped from the record-shaft and carrying with it the record serves to prevent injury to the record and is convenient in removing and replacing the records both in their cases and into the instrument.

I do not claim herein the subject-matter shown and claimed in my application, Serial No. 25,549, filed August 1, 1900.

Having thus fully described my invention, what I claim is—

1. In a sound-producing instrument, a tubular feed-screw mounted on a shaft, and means for giving both a rotary and an endwise movement to said feed-screw simultaneously.

2. In a sound recording and reproducing instrument, a hollow feed-screw fitted to move longitudinally on a shaft, and provided with ball-bearings, and means for revolving and moving said feed-screw longitudinally at the same time.

3. In a sound-reproducing instrument, a tubular feed-screw, a record-drum secured thereto, and means for giving both a rotary and a longitudinal movement to said feed-screw and record-drum simultaneously.

4. In a sound-reproducing instrument, a tubular feed-screw, mounted to slide lengthwise on a shaft provided with ball-bearings, a record-drum, detachably connected to said feed-screw, and means for imparting both a rotary and a longitudinal movement to said feed-screw and drum simultaneously.

5. In a sound-producing instrument, an arm, means for vertically adjusting said arm, a reproducer attached to said arm, a tubular feed-screw, a record-drum secured thereto, and means for simultaneously imparting both a rotary and a longitudinal motion to said feed-screw and record-drum.

6. In a sound-reproducing instrument, an

arm having an aperture in its outer end, a reproducer seated in the aperture, a vertical member on said arm, a guideway on the frame of the instrument for said vertical member, a thumb-screw for holding said vertical member in adjusted position in the guideway, in combination with a record and means for simultaneously imparting both a rotary and a longitudinal movement to said record.

7. In a sound-reproducing instrument, a record-shaft having conically-recessed ends, adjustable centers having pointed ends fitting said recessed ends in the record-shaft, bearings for said centers, a longitudinal groove in said record-shaft, a record-drum on said shaft and a feed-screw connected to said drum, said feed-screw having a longitudinal groove therein and balls in the groove, and means for imparting a simultaneous rotary and a longitudinal movement to said feed-screw and record-drum.

8. In a sound-reproducing instrument, a record-shaft, a tubular feed-screw on said shaft, a record-drum fitting said shaft, means for connecting and disconnecting the record-drum and feed-screw, said drum being removable from the shaft, substantially as described.

9. In a sound-reproducing instrument, a record-shaft, a tubular feed-screw on said

shaft, a record-drum attached to said feed-screw, means for revolving said shaft and imparting a simultaneous rotary and a longitudinal movement to said feed-screw and record-drum, and a speed-regulator for said shaft.

10. In a sound-reproducing instrument, a tubular feed-screw, a shaft passing through said feed-screw, a record-drum detachably connected to said feed-screw, a nut for feeding the screw, said nut being mounted upon a pivoted bar, a spring for holding the nut in contact with the screw, and a lever for holding the nut out of contact with said feed-screw.

11. In a sound-reproducing instrument, a record-shaft, a tubular feed-screw thereon, a record-drum detachably connected to said feed-screw, and fitted to slide on said shaft, a disk on the feed-screw, a latch on the drum, a conical bearing for connecting said screw and drum, a nut adapted to be thrown into and out of contact with said feed-screw, and means for imparting a rotary motion to said shaft, feed-screw and drum.

In testimony whereof I affix my signature in presence of two witnesses.

FREDERICK MYERS.

Witnesses:

F. L. OURAND,
GEORGE J. WEBER.

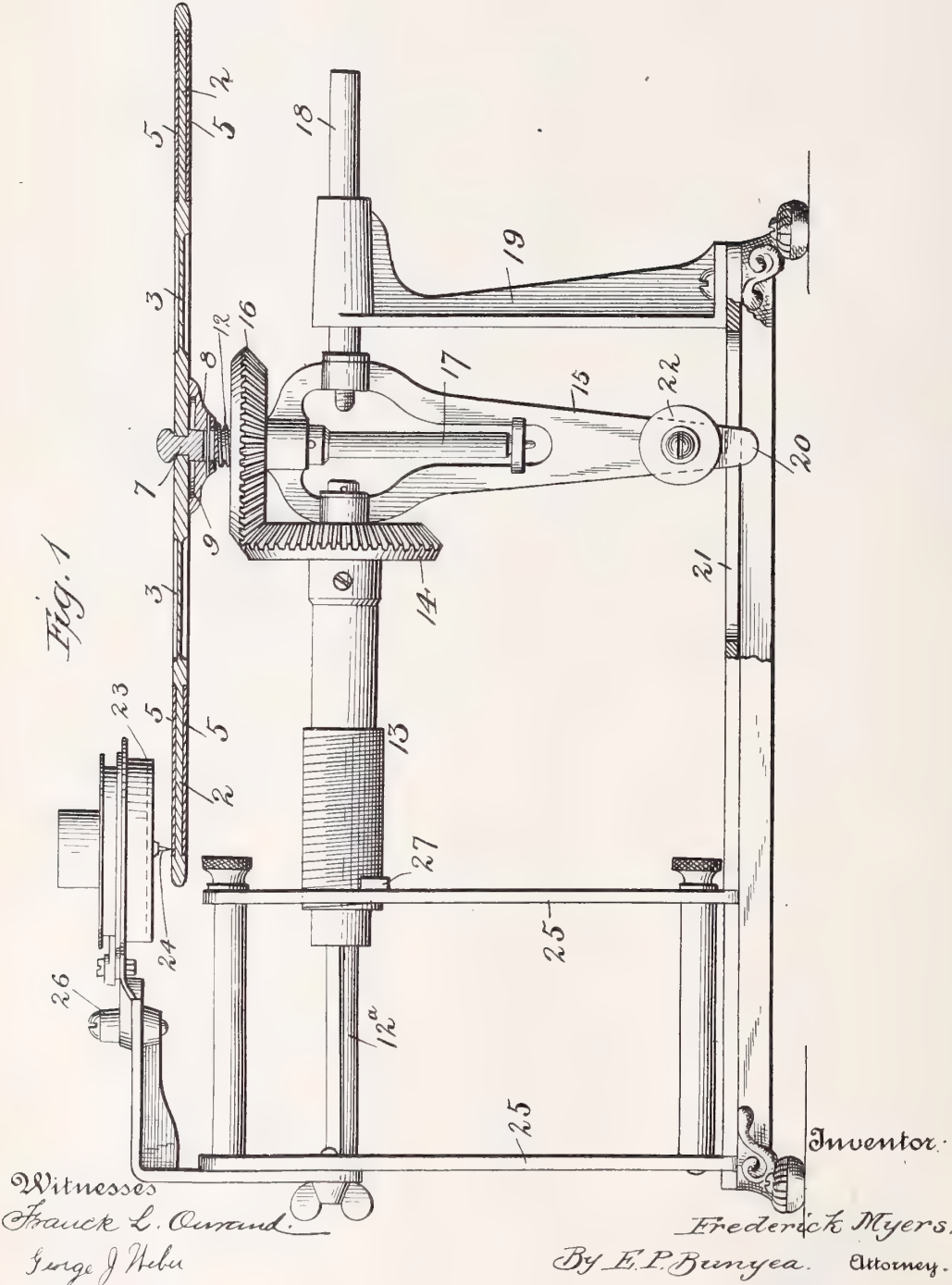


F. MYERS.
PHONOGRAPH.

(Application filed Oct. 12, 1900.)

(No Model.)

3 Sheets—Sheet 1.



F. MYERS.
PHONOGRAPH.

(Application filed Oct. 12, 1900.)

(No Model.)

3 Sheets—Sheet 2.

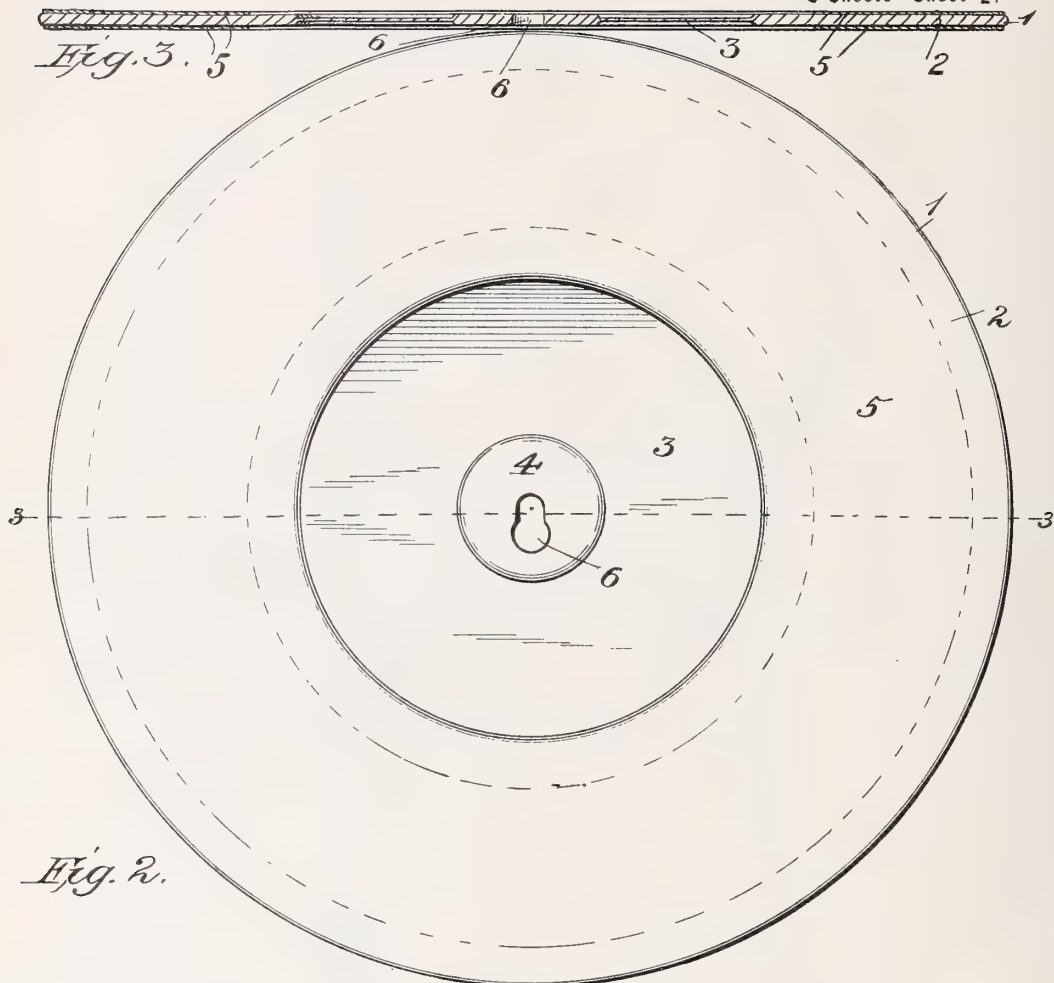


Fig. 2.

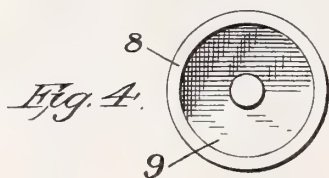


Fig. 4.

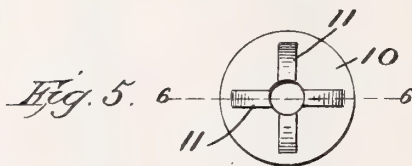


Fig. 5.

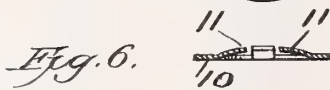


Fig. 6.

Witnesses
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Inventor
Frederick Myers,
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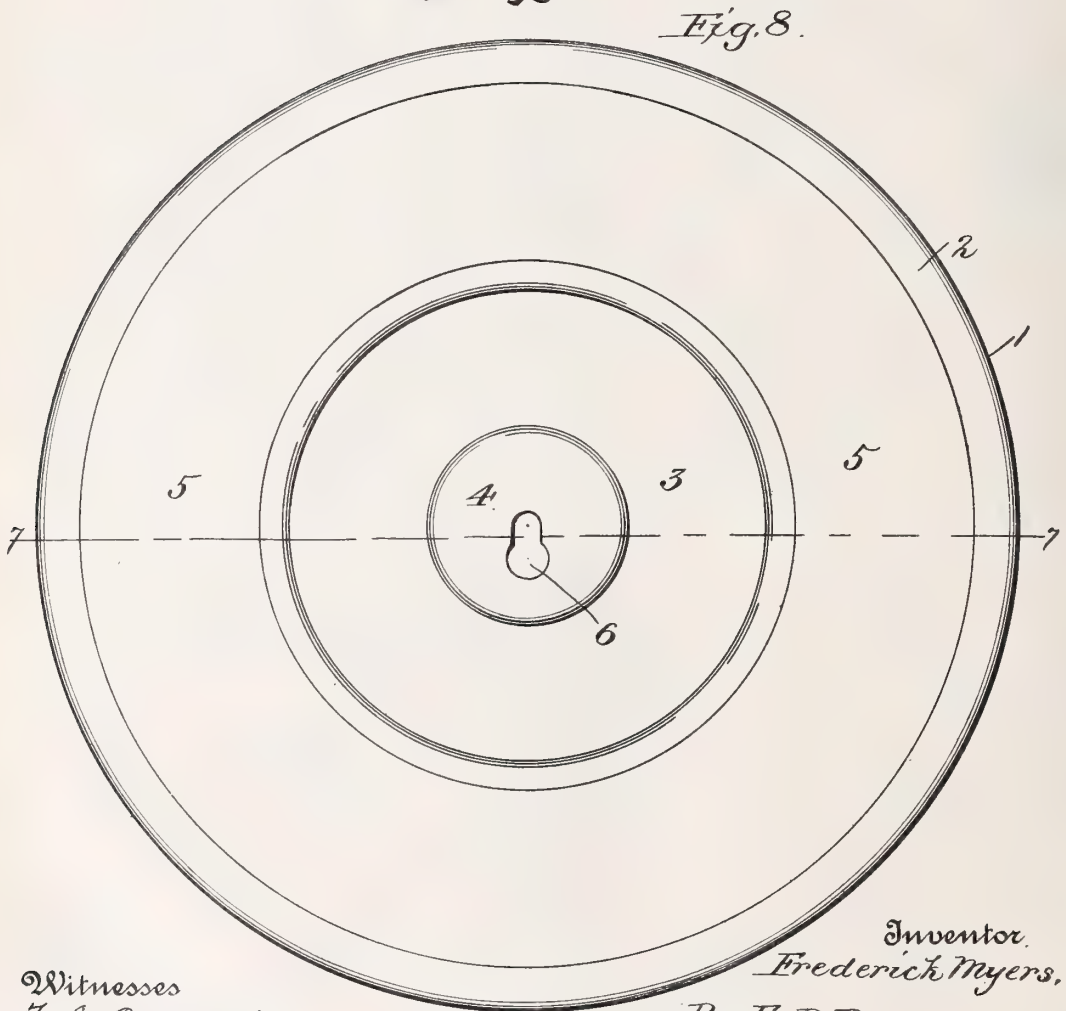
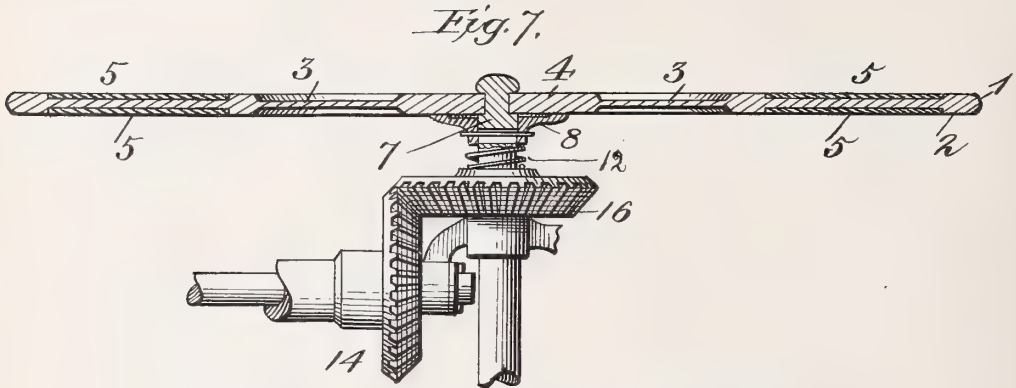
Patented Dec. 4, 1900.

F. MYERS.
PHONOGRAPH.

(Application filed Oct. 12, 1900.)

(No Model.)

3 Sheets—Sheet 3.



Witnesses
F. L. Ouraud
George J. Hake

Inventor.
Frederick Myers.
By E. P. Bunyea,
Attorney

UNITED STATES PATENT OFFICE.

FREDERICK MYERS, OF NEW YORK, N. Y.

PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 663,194, dated December 4, 1900.

Application filed October 12, 1900. Serial No. 32,869. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK MYERS, a citizen of the United States, residing at New York city, in the county of New York and State of New York, have invented certain new and useful Improvements in Phonographs; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the figures of reference marked thereon, which form a part of this specification.

This invention relates to phonographs, and particularly to record-disks to be used on sound-reproducing instruments of different kinds. In the machines of this character which use the disk records it has been the customary practice to mount a rigid inflexible disk upon a rigid central support and to provide some means for revolving the support and record and at the same time move the record laterally, the style being permitted to follow the grooves of the record by gravity or by spring action. It has been found in practice that many defects exist in machines of this character owing to the fact that both the style and the record are constructed to move in unison, each depending upon the other for a portion of the action required. By a long series of experiments it has been discovered that if all the movements necessary are given to the record-disk a much more perfect reproduction is attained, since there is no interdependence of one part upon another. Moreover, by giving all the necessary movements to one part—the record—a much more simple and less complicated arrangement of mechanism may be employed. To overcome the existing defects in this class of machines, it has been proposed to mount a rigid record-disk upon a yielding support in order that the disk may be held in contact with a style, the record having the necessary revolution and lateral movements imparted to it to make the style follow the grooves in the record; but this I do not claim as my present invention. By further experiments I have ascertained that this construction may be greatly improved and simplified by using a record-disk having an elastic or yielding central por-

tion. With such a record a stationary style may be used, and if the record-disk is rotated and fed laterally the style will follow the grooves in the record-disk in a regular and perfect manner owing to the fact that the record is always held in contact with the style by its inherent flexibility or yielding central portion. The best results have been attained by the use of a celluloid record-disk having a comparatively thin flexible central portion and a rim of greater thickness having the record embossed therein. Other materials, like vulcanite, indurated fiber, or parchment, produce good results; but celluloid is preferred for many reasons and may be molded of the required form and thickness in different parts at a comparatively slight cost.

In its broadest aspect my present invention contemplates a record-disk made of any suitable material having a flexible or yielding portion which serves to hold the record up to a style by its inherent resiliency. This invention also includes the necessary parts of the instrument upon which such a record-disk may be made available.

In the accompanying drawings, which form a part of this specification, Figure 1 is a side elevation of so much of a sound-reproducing instrument as is deemed necessary to illustrate my present invention and showing the record-disk and its central supporting-pin in section and a portion of the base of the instrument broken away to better illustrate certain parts. Fig. 2 is a plan view of a record-disk made in accordance with my invention. Fig. 3 is a transverse section on the line 3 3, Fig. 2. Fig. 4 is a plan view of a support for the record-disk. Fig. 5 is a plan view of a spring-plate which may be used for holding the record in place on the central pin and on the support shown in Fig. 4. Fig. 6 is a transverse section on line 6 6, Fig. 5. Fig. 7 is a detail elevation of the miter-gears for rotating the record and showing in section a modified form of record-disk, taken on line 7 7, Fig. 8, the central pin, and a modified form of support for the record. Fig. 8 is a plan view of the record-disk shown in Fig. 7.

Like numerals of reference designate like parts wherever they occur in the different views of the drawings.

Referring to Figs. 1, 2, and 3 of the drawings, the numeral 1 designates a record or tablet, which is by preference made of celluloid and may be provided with a thickened outer portion 2, a thin flexible or yielding portion 3, and a central hub 4. The record may be formed directly in the tablet and may be embossed or cut upon both sides of said tablet, if desired, or the record may be formed in a thin ring of papier-mâché or other material and secured to the celluloid tablet. As shown in Figs. 7 and 8, the records are secured in recesses formed in the tablet, thus giving practically a flush surface at the top and bottom of the tablet at the outer portion thereof. A keyhole-slot 6 is formed in the central hub 4 to accommodate the central pin 7. When the tablet is placed upon the pin 7 and moved until the head of said pin is over the smaller portion of the keyhole-slot 6, it will be held in place to rotate with said pin by any suitable means. In Figs. 1, 4, 5, and 6 is illustrated a support 8, secured to the central pin 7, said support 8 serving as a firm seat for the tablet and having an area of some extent as a bearing-surface for said tablet. The upper face of the support 8 is recessed, as at 9, and in this recess is a plate 10, having spring-fingers 11 cut therefrom. The function of these spring-fingers is to hold the tablet firmly in place between the head of the pin 7 and the upper portion of the support 8. The same effect may be produced in other ways—as, for instance, by mounting the support 8 so that it may have a limited vertical play upon the pin 7 and backing it up by a short spiral spring 12, as shown in Fig. 7. It will be understood that the tablet 1 is to be firmly secured to the central pin 7 and that the necessary resiliency is given to the tablet solely by the thin flexible portion 3 thereof.

In Fig. 1 I have shown a portion of an instrument with which may be used such a record as has been described. In said figure the numeral 12 designates the feed-screw shaft, and 13 a tubular feed-screw mounted to slide on said shaft and to rotate therewith. Secured to one end of the feed-screw is a miter-gear 14. One end of the shaft 12^a is journaled in a sliding bracket 15. The miter-gear 16 is secured to a vertical shaft 17, journaled in the sliding bracket 15, the shaft 17 having its upper end formed as a central pin 7 to support the tablet or record-disk. A stub-shaft 18 is secured at one of its ends to the sliding bracket 15, and said stub-shaft is journaled to revolve and slide in a rigid bracket 19, rising from the base of the instrument. The sliding bracket 15 has a toe 20 at its lower end, which may move laterally in a slot 21, formed in the base of the instrument, and a roller 22, secured to said sliding bracket, bears upon said base at the side of slot 21 to reduce friction, sustain the weight, and keep the parts in position. The sound-box 23 may consist of a plain casing having a diaphragm secured therein, and the style 24 may be secured di-

rectly to the diaphragm. The sound-box may be supported upon an arm adjustably secured to the motor-frame 25, and, if desired, the arm may be jointed or pivoted, as at 26, to permit the sound-box to be swung aside when it is desired to put on a new record. The feed-nut 27, which may be of ordinary construction, is attached to an arm in the usual manner, so that it may be thrown into and out of contact with the feed-screw 13 to move the record laterally or to stop the feed. Any suitable motor may be used, and it may be mounted in the frame 25.

The operation of the machine is as follows: The record-disk is secured to the central pin 7, as previously described, and when the feed-shaft 12 is revolved by the motor and the nut 27 is thrown into contact with the feed-screw 13 the record is revolved by the miter-gears 14 and 16 and moved laterally to the left in Fig. 1 by the feed screw and nut. The style 24 is held in contact with the record-grooves by means of the flexible portion 3 of the tablet. A record-tablet made as described is very sensitive to the action of the style and is held up to the style with just the required force to give the best results. It will be noted that while the portion 3 of the tablet 1 is resilient, flexible, or yielding the portion upon which the record is formed or secured is practically non-yielding or rigid. It will also be noted that a record may be formed on or secured to both sides of the tablet and that the style may be held in a practically-stationary position, and hence does not require a weighted lever or a spring to support it. The record which is herein described may be used with a machine having means for moving the sound-box laterally across the record while the record is merely revolved. In such a machine the record-tablet would be held up to the style by the yielding or resilient portion 3 of the tablet in the same manner as described with the machine shown. The tablets may be comparatively thin, even in the portions upon which the records are embossed or secured, owing to the fact that when embossed the material is rendered dense and compact by the necessary pressure to produce the sound-grooves.

Having thus fully described my invention, what I claim is—

1. A record-tablet having a central flexible portion and a record upon the outer portion.
2. A record-tablet having a thin yielding portion and a thicker non-yielding portion for the record.
3. A record-disk made of celluloid or similar material and having a thin, elastic portion and an outlying non-yielding portion for the record.
4. A record-disk having a central hub, a record upon the face of said disk, and a flexible portion intermediate the hub and record.
5. A record-disk having a yielding portion, a rigid center and a rigid support for a record, in combination with a style.

6. A record-tablet having a non-yielding central hub, a rigid outer record-rim, and an intermediate flexible portion, in combination with a rigid central supporting-pin and a stationary style.

7. A record-disk having a non-yielding central hub secured to a central pin, record on the face of the disk, a flexible portion therein, in combination with a style.

8. A record-tablet having a yielding portion, a rigid support for a record, a stationary style, and means for revolving the tablet and moving it laterally in contact with the style.

9. In a sound-reproducing machine, a style, a record-tablet having a central hub rigidly secured to a central pin, a record on the face of the tablet, a flexible portion in the tablet between the hub and record to hold the record in contact with the style, in combination with means for revolving the tablet.

In testimony whereof I affix my signature in presence of two witnesses.

FREDERICK MYERS.

Witnesses:

GUY E. PADGETT,
S. W. COCKRELL.

No. 663,537.

Patented Dec. 11, 1900.

W. E. FURNISS.
HORN SUPPORT.

(Application filed Apr. 12, 1900.)

(No Model.)

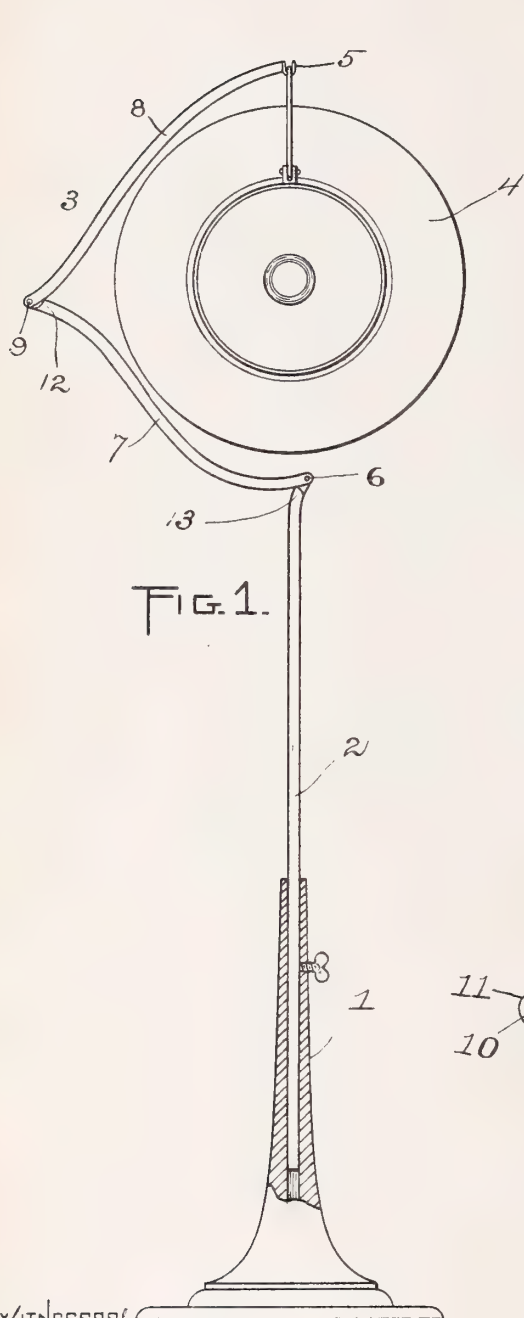


FIG. 1.

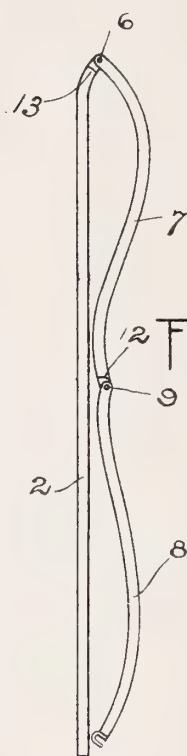


FIG. 2.

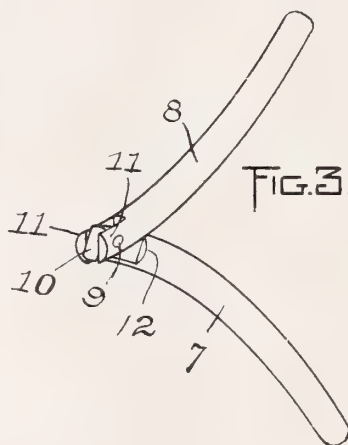


FIG. 3.

WITNESSES:

E. Satchelder
A. D. Hornum,

INVENTOR:

Wm. E. Furniss
by Wright, Brown & Lundy
Attys.

UNITED STATES PATENT OFFICE.

WILLIAM E. FURNISS, OF CAMBRIDGE, MASSACHUSETTS, ASSIGNOR OF ONE-HALF TO FREDERICK H. PRATT, OF BOSTON, MASSACHUSETTS.

HORN-SUPPORT.

SPECIFICATION forming part of Letters Patent No. 663,537, dated December 11, 1900.

Application filed April 12, 1900. Serial No. 12,651. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM E. FURNISS, of Cambridge, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Horn-Supports, of which the following is a specification.

This invention consists in an improved folding crane adapted to support the horn or sound-amplifier of a talking-machine or a similar article.

Of the accompanying drawings, Figure 1 represents a rear elevation, partly in section, showing my invention in use. Fig. 2 represents an elevation of the crane in folded form. Fig. 3 represents a detail perspective view of one of the hinge-joints.

The same reference characters represent the same parts wherever used in the drawings.

1 designates a suitable base or stand, to which the supporting-crane is shown as removably and adjustably attached. 2 is the upright or vertical stem of the crane, and 3 is the neck, laterally bowed or looped in the plane of stem 2 and having at its upper end a hook 5, by means of which the supported article may be suspended. In the drawings a horn or trumpet 4, such as is commonly employed to amplify the sound from a talking-machine, is shown as suspended from the hook 5 and occupying the space provided by laterally bowing or looping the neck 3.

Instead of rigidly connecting the neck 3 of the crane to the stem 2, which is the common practice in making supports of this character, I connect the two by a pivotal joint at 6, so that when the crane is not in use it may be folded into a reduced compass, and, furthermore, I also make the neck itself in sections—a lower section 7 and an upper section 8—pivoted together at 9, the two sections of the neck straightening out when the crane is folded into its reduced form, as shown in Fig. 2.

The hinge-joints between the stem and neck and between the parts or sections of the neck may permissibly be constructed as shown in Fig. 3, which illustrates the joint between the two parts of the neck. In this construction a reduced or flattened lug 10 is formed on one of the neck parts, as 7, and two ears

11 11 are formed on the other part 8, the said two ears embracing the lug 10 and the pintle 9 passing through said ears and lug. Part 7 is also formed with shoulders 12 adjacent to the axis of the hinge-joint, upon which shoulders the part 8 rests to limit the downward movement of said part 8 when the neck of the crane is operatively positioned. Part 8 is thus supported upon part 7 at the joint between the two. A similar construction may be adopted for the hinge-joint between part 7 of the neck and stem 2, the latter being shown as provided near the axis of the hinge with a shoulder 13, on which part 7 is supported in operative position. It is to be noted that the vertical line of suspension from hook 5 falls to the left or rear of pivot-point 6, so as to prevent the pivoted neck 3 from overbalancing to the right of the stem when the weight of the horn is upon it.

In Fig. 2 the relative positions occupied by the parts of the crane when folded are shown. The parts of the neck by turning at pivot 9 are then brought substantially into alinement with each other and are folded over parallel to the stem 3 by turning about the pivot 6. When in this form it is readily seen that the crane occupies a much reduced space or compass, enabling it to be easily packed or stowed, and thereby effecting the object of the invention.

The device can very quickly be brought from its folded condition to its expanded or operative condition, and vice versa.

I claim—

1. A crane or support for talking-machine horns and similar articles, comprising an upright stem, and a laterally looped or bowed neck pivotally jointed to the upper end of said stem and adapted to support the horn by suspension from its upper end, said neck consisting of sections pivotally jointed together, and the whole being adapted to fold together into a reduced compass.

2. A crane or support for talking-machine horns and similar articles, comprising an upright stem, and a laterally looped or bowed neck pivotally jointed to the upper end of said stem and adapted to support the horn

by suspension from its upper end, said neck
consisting of a lower section and an upper
section pivotally jointed together, the stem
and sections of the neck having at their joints
5 coacting abutments whereby each superposed
part is supported at the joint in operative
position upon the part beneath it, the parts
being so related as to fold into a reduced com-

pass, with the two sections of the neck in sub-
stantial alinement parallel to the stem. 10

In testimony whereof I have affixed my sig-
nature in presence of two witnesses.

WILLIAM E. FURNISS.

Witnesses:

R. M. PIERSON,

P. W. PEZZETTI.

No. 664,223.

Patented Dec. 18, 1900.

T. B. LAMBERT.
PHONOGRAPH RECORD.
(Application filed Mar. 3, 1900.)

(No Model.)

Fig. 1.

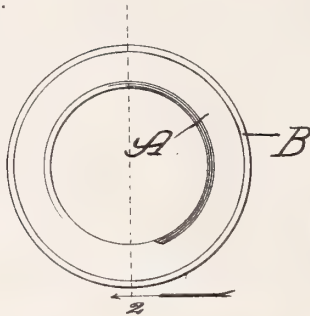


Fig. 2.

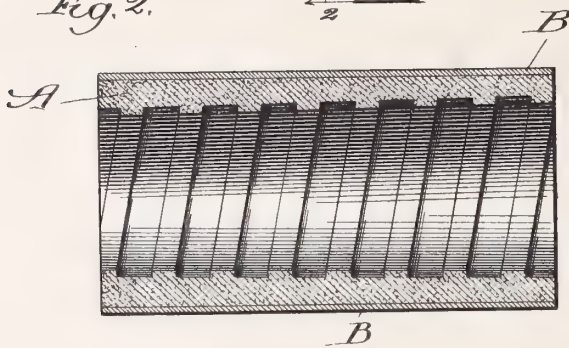
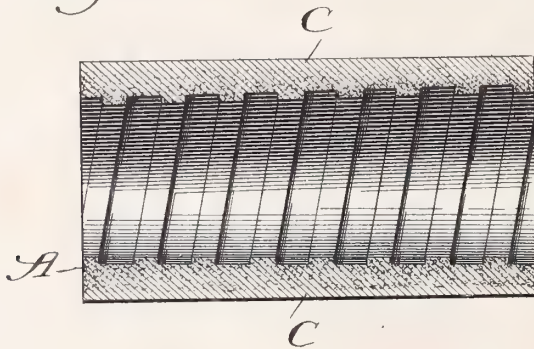


Fig. 3.



Witnesses:

Edw. C. Ghyld
John Enders Jr.

Inventor:

Thomas B. Lambert,
By Panning & Panning & Sheridan,
Attys.

UNITED STATES PATENT OFFICE.

THOMAS B. LAMBERT, OF CHICAGO, ILLINOIS.

PHONOGRAPH-RECORD.

SPECIFICATION forming part of Letters Patent No. 664,223, dated December 18, 1900.

Application filed March 3, 1900. Serial No. 7,191. (No model.)

To all whom it may concern:

Be it known that I, THOMAS B. LAMBERT, a citizen of the United States, residing at Chicago, Illinois, have made certain new and useful Improvements in Phonograph-Cylinders, of which the following is a specification.

The object of my invention is to cheapen the cost of phonographic cylinders by employing in their construction a cheaper grade of material for the main body of the cylinder than has heretofore been used and providing the surface of the cylinders only with a sufficient quantity of the expensive or fine material to form a surface or coating of the requisite homogeneous character on which the impressions are made; and my invention consists in the features and details of construction hereinafter described and claimed.

In the drawings, Figure 1 represents an end view of one of my improved phonographic cylinders. Fig. 2 represents a longitudinal section taken on the line 2 of Fig. 1, and Fig. 3 represents a longitudinal section of a cylinder somewhat modified in construction.

In making my improved cylinder for phonographs I make the interior body of the cylinder of a composition A of celluloid or other suitable material, which may be formed of coarse and cheap ingredients and such as would not be of the quality of requisite fineness, delicacy, or homogeneity to receive the impressions adequate for use. This coarseness or cheapness of the ingredients used is represented in the body or interior of the cylinder by the dots in the drawings. The interior surface or form of the cylinder is intended to be made in the usual way to adapt it to be placed on the mandrels usually employed in phonographs or similar machines and need not be described in detail or at length. To give the cylinder the fine and homogeneous surface or exterior adapted to receive the record impressions, I provide it with a coating, cover, or veneer B, made of material of the requisite fineness. This coating or veneer may be composed of the same material as that forming the body of the cylinder, except that it must be of the requisite fineness and delicacy for the purpose intended, although, if preferred, it may be formed of different suitable material. It may be

made either integral with the body of the cylinder or as a separate envelop and afterward applied. In either case, however, due regard should be had to their relative coefficients of contraction and expansion, so that as expansion or contraction takes place due to changes of temperature little or no strain will occur between the two, so as to insure the permanence of their form and relation.

If preferred, a solution of the requisite fine material can be applied to the exterior surface of the cylinder, so as to form the cover, coating, or veneer desired. The solution in such case may consist of the same material composing the body of the cylinder, except that it should be of a finer or superior grade, so as to be of a more homogeneous quality to present an exterior surface of the requisite fineness to receive the record impressions. When celluloid is used both for the body of the cylinder and as the base of the solution, the solvent that I prefer to employ for the solution is methyl acetate or ethyl acetate. In treating the exterior surface of the cylinder to the solution I prefer to rotate the surface of the cylinder instead of submerging or dipping, as in such case no greater amount of the solution will be required than to cover or veneer the exterior surface.

In Fig. 3 I have shown still another modification. In this case the body of the cylinder is formed, as already explained, of celluloid or similar material. To make the exterior surface of sufficient fineness and homogeneity to receive the record impressions and reproduce the records therefrom, I treat such surface, if the cylinder is made of celluloid, with a solvent such as methyl acetate or ethyl acetate. In such case the surface of the cylinder and the solvent coming in contact with it forms a solution over the surface in which the finer particles are brought to the surface and the impurities or coarser particles left at a greater depth in the cylinder, so that a surface is produced of the requisite fineness and quality desired; but however made the cylinder is formed of an interior body portion of coarse or cheap material and an exterior surface of fine and suitable similar material adapted for the purpose for which it is to be used.

While I have described my invention as it is employed in the manufacture of phonograph-cylinders, yet it is obvious that it may be used in the manufacture of other impression-records besides those of phonograph-cylinders and that it is not necessary in order to secure the benefits of the invention that the impression-surface be made in cylindrical form, as it is apparent that the invention is applicable to all cases where it is desired to make a body portion of coarse particles of celluloid or other suitable material and the surface intended to receive delicate impressions of a finer quality of the same material whether the impression-record be intended for use in a phonograph or other similar mechanism or whether the impression-surface of such record be curved or flat.

What I regard as new, and desire to secure by Letters Patent, is—

1. As a new article of manufacture, an impression-record having its body portion formed of coarse material and its impression-surface formed of similar material of a finer and more homogeneous quality, substantially as described.

2. As a new article of manufacture, an impression-record having its body portion formed of coarse material and its impression-surface formed of similar material of a finer and more homogeneous quality integral therewith, substantially as described.

THOMAS B. LAMBERT.

Witnesses:

EPHRAIM BANNING,
THOMAS B. MCGREGOR.

No. 665,601.

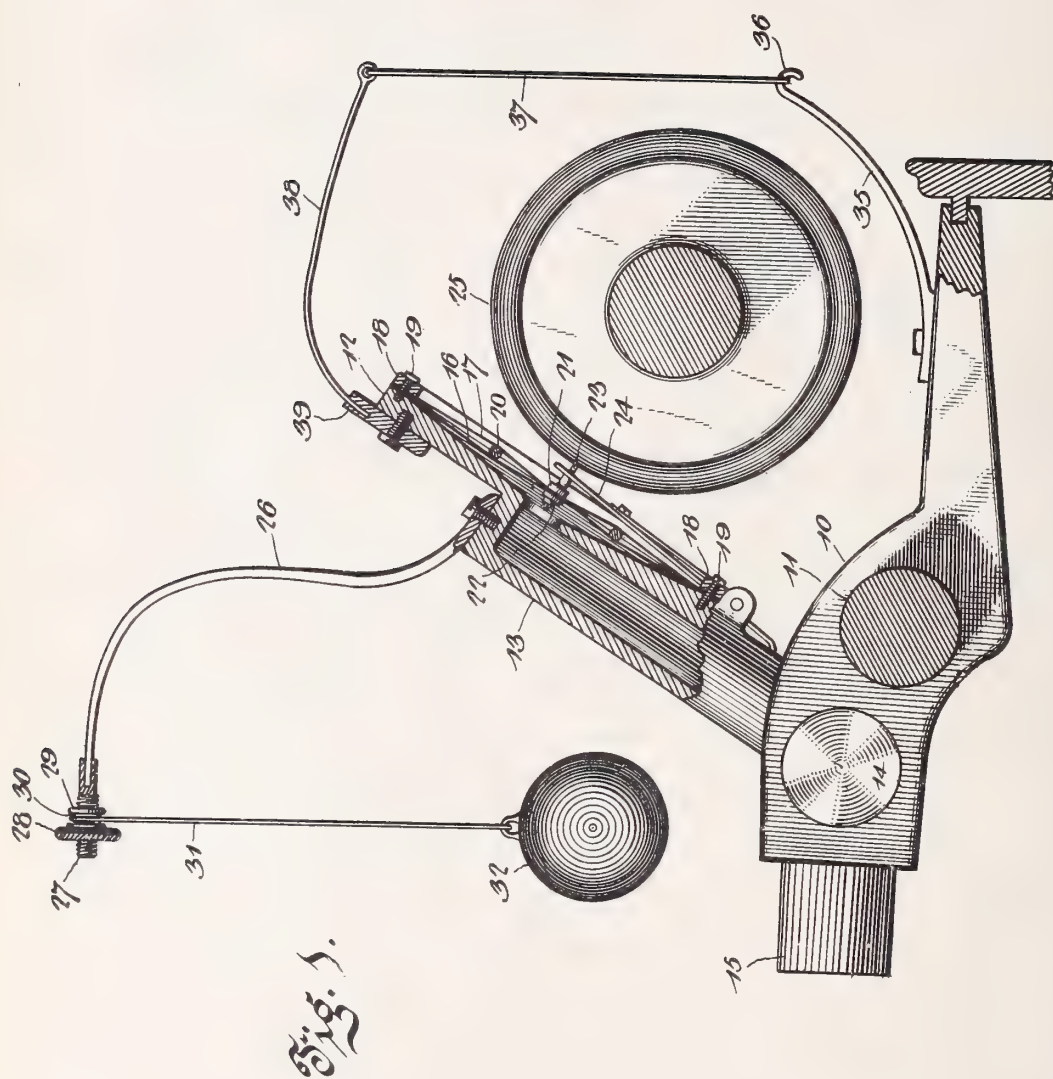
Patented Jan. 8, 1901.

W. HART.
GRAPHOPHONE REPRODUCER.

(No Model.)

(Application filed Nov. 2, 1899.)

2 Sheets—Sheet 1.



Witnesses
H. Kaufleuerwell
Geor. Chandler

William Hart, Inventor.
By *his* Attorneys,

C. Snow & Co.

No. 665,601.

Patented Jan. 8, 1901.

W. HART.
GRAPHOPHONE REPRODUCER.

(No Model.)

(Application filed Nov. 3, 1899.)

2 Sheets—Sheet 2.

Fig. 2.

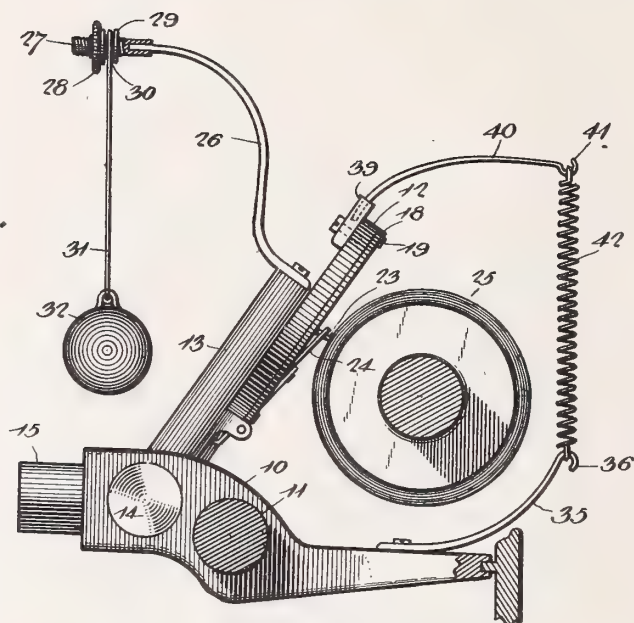
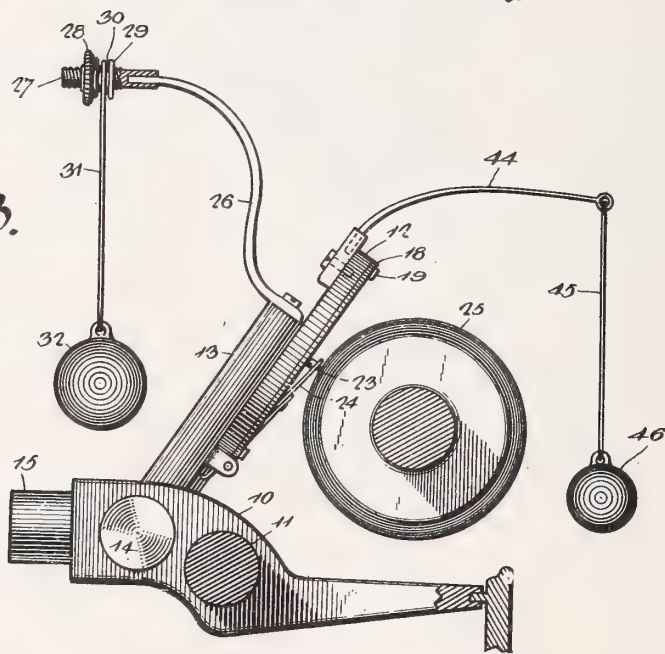


Fig. 3.



Witnesses

J. Trautlenberg.

Geo. H. Chandler.

By his Attorneys,

William Hart, Inventor.

C. A. Snow & Co.

UNITED STATES PATENT OFFICE.

WILLIAM HART, OF KIRKSVILLE, MISSOURI.

GRAPHOPHONE-REPRODUCER.

SPECIFICATION forming part of Letters Patent No. 665,601, dated January 8, 1901.

Application filed November 2, 1899. Serial No. 735,609. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM HART, a citizen of the United States, residing at Kirksville, in the county of Adair and State of Missouri, have invented a new and useful Graphophone-Reproducer, of which the following is a specification.

This invention relates to graphophone-reproducers in general, and more particularly to the construction and equipment of the sound-box and diaphragm; and it has for one object to provide means for counterbalancing the weight of the sound-box and at the same time for holding the sound-box yieldably with the stylus in engagement with the record, the construction preventing the rattling and other noises incident to looseness of the stylus upon the record.

A further object of the invention is to provide a construction and arrangement of diaphragm which will permit adjustment of the tension of the diaphragm in a simple and efficient manner.

In the drawings forming a portion of this specification, and in which similar numerals of reference designate like and corresponding parts in the several views, Figure 1 is a side view of the sound-box and its supporting-bracket with the end of the record parts being shown in section and parts in elevation. Fig. 2 is a view similar to Fig. 1 on a similar scale and showing in elevation a modification of the means for holding the sound-box in the direction of the record. Fig. 3 is a view similar to Fig. 2, showing a different means for holding the sound-box in the direction of the record.

Referring now to the drawings, 10 represents the bracket which supports the sound-box, and which bracket has the usual slide-bearing 11. The exterior of the sound-box is of the usual construction and comprises the diaphragm-receiving frame 12 upon the rear side and radially of which is secured a sound-tube 13, the lower end of which is provided with trunnions 14, which have a bearing in the bracket 10. The lower end of the sound-tube has an extension 15, which is adapted to receive the horn or the ear-tubes. The front face of the frame 12 is dished, as shown, and upon this front face and engaging the outer edges thereof is disposed the diaphragm, com-

prising two disks 16 and 17, of metal or of other suitable material, which are clamped upon the frame 12 through the medium of a common clamping-ring 18, provided with clamping-screws 19. Between the elements 16 and 17 and concentric therewith is disposed a rigid ring 20 of proper diameter, and which is preferably circular in cross-section or has such other form as will cause it to engage the elements 16 and 17 each in a single line. Centrally of the elements 16 and 17 is formed a perforation, through which is passed a headed bolt 21, having a clamping-nut 22. By means of this nut 22 and the bolt the central portions of the elements 16 and 17 may be brought together and the tension of the elements thus increased, the increase of tension being of course dependent upon the thickness of the ring 20 and consequent normal separation of the elements and also upon the diameter of the head of the bolt and of the nut.

The stylus 23 in the present instance is supported by an arm 24, which has a universal connection with the sound-box and which connection, as also the arm, is constructed in accordance with a prior application for United States patent filed by me on the 22d day of July, 1899, and which application bears the Serial No. 724,823. The head of the bolt 21 forms the engaging surface for the rear end of the stylus 23, the opposite end of the stylus being adapted for engagement with the record, which is indicated at 25.

Connected with the upper closed end of the sound-tube 13 or with any other suitable portion of the sound-box is a compound curved arm 26, which extends outwardly and upwardly and then rearwardly to a point beyond the pivotal connection of the lower end of the sound-tube with the bracket 10, and the outer end of this arm is provided with a screw-threaded enlargement 27, which is adapted to receive a thumb-nut 28, which has an extension 29, provided with a peripheral groove 30. With this groove 30 is engaged a cord or wire 31, with a weight 32 attached to its lower end. This weight tends to counterbalance the weight of the sound-box and its connected parts, and thus to neutralize to some degree the pressure of the stylus upon the record. By shifting the thumb-nut 28 upon the threaded extension 27 the position of the

weight 32 with respect to the pivotal connection at 14 may be varied, and the counterbalancing effect of the weight may be altered to secure the best results under different conditions.

One effect of the counterbalancing-weight 32 is to cause the stylus 23 to lie so lightly against the record 25 as to cause the sound-box itself to yield in the operation of the machine, and thus counteract to some extent the vibrating effect of the stylus upon the diaphragm. In order to prevent this action, a second arm 35 is connected with the bracket 10 and extends rearwardly thereof and beyond the rear face of the record. The outer end of this arm is provided with a hook 36, which is engaged with a flexible connection 37, attached at its upper end to the free end of a spring-plate 38, the opposite end of which is fixed in a block 39, secured to the sound-box. The effect of the spring-plate 38 will be readily understood, and in its upward pull upon the connection 37 it forces and holds the sound-box, with the stylus, in engagement with the record.

Instead of employing a spring-plate 38 and the connection 37 an arm 40 (shown in Fig. 2 of the drawings) may be secured to the sound-box in the same manner as the spring-plate 38 and in the same position and may be provided with a hook 41 in its outer end having a helical spring 42 connected therewith, the opposite end being attached to the hook 36.

In Fig. 3 is shown a further modification in which the arm 35 is omitted, while attached to the outer end of the spring-arm 44, which is carried by the sound-box, is a wire or cord 45, having a weight 46 attached to its lower end, this wire or cord passing below and at the rear side of the record in the same manner as does the connection 37 and the helical spring above described.

From the above description it will be seen that with the present structure the tension of the diaphragm may be varied at will and also that the pressure of the stylus upon the record may be modified and the rebounding of the sound-box prevented, the result being a most efficient operation of the machine.

What is claimed is—

1. The combination with a pivoted sound-box having an arm connected therewith and extending beyond and above the pivot of the box, of a nut having threaded engagement with the arm, a flexible connection attached to the nut, and a counterbalancing-weight attached to the connection.

2. The combination with a pivoted sound-box having an arm connected therewith and extending beyond its pivot, of a cord adjustably connected with the arm, and a weight attached to the cord and adapted to swing therewith.

3. The combination with a sound-box, of a diaphragm comprising two disks secured at their edges to the box, means for holding the disks separated at points between their centers and their peripheries, and means for drawing the disks toward each other to increase their tension.

4. The combination with a sound-box, of a diaphragm comprising a plurality of disks secured to the box, means for holding the disks separated at points within their points of attachment to the box, and means for varying the distance between corresponding other points of the disks to vary the tension of the diaphragm.

5. The combination with a sound-box, of a diaphragm comprising two disks secured at their edges to the box, means for holding the disks separated at points between their centers and their peripheries, and means for drawing the disks toward each other at their centers to increase the tension thereof.

6. A diaphragm comprising two plates mutually connected at their peripheries and normally separated at points, and means for drawing the plates toward each other to increase their tension.

7. A diaphragm comprising two plates mutually connected at their peripheries and adapted to vibrate in unison, means for holding the disks separated at points and means for varying the separation of the plates at other points to vary their tension.

8. The combination with a sound-box, of a diaphragm comprising two plates connected at their edges to the box, a ring disposed between the plates and in engagement therewith, a headed bolt passed through the plates within the inclosure of the ring, a nut upon the bolt adapted to draw the plates toward each other, a stylus-arm mounted upon the box, and a stylus carried by the arm and adapted for engagement with the bolt to transmit motion to the diaphragm.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

WILLIAM HART.

Witnesses:

MYRON A. MILLER,
BESS SANDS.



No. 666,493.

Patented Jan. 22, 1901.

F. L. CAPPS.

DUPLICATE SOUND RECORD AND PROCESS OF FORMING SAME.

(Application filed Mar. 8, 1899.)

(No Model.)

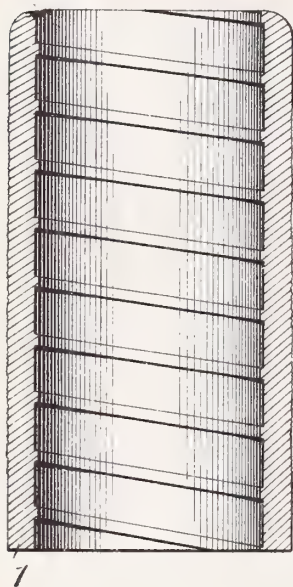


Fig. 1.

Fig. 2.

Fig. 3.

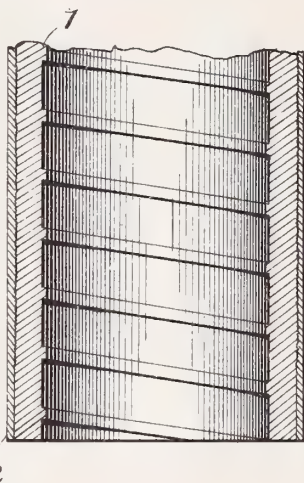
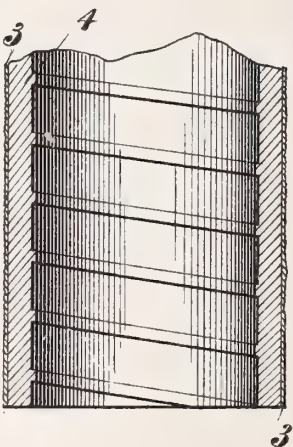
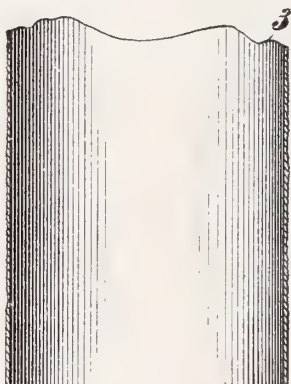
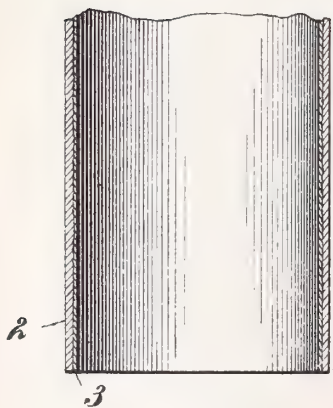


Fig. 4.

Fig. 5.

Fig. 6.



WITNESSES

Wm. A. Courtland

M. V. Bidgood

INVENTOR

Frank L. Capps

BY

Attorneys

UNITED STATES PATENT OFFICE.

FRANK L. CAPPS, OF NEWARK, NEW JERSEY, ASSIGNOR TO THE AMERICAN
GRAPHOPHONE COMPANY, OF WASHINGTON, DISTRICT OF COLUMBIA.

DUPLICATE SOUND-RECORD AND PROCESS OF FORMING SAME.

SPECIFICATION forming part of Letters Patent No. 666,493, dated January 22, 1901.

Application filed March 8, 1899. Serial No. 708,183. (No model.)

To all whom it may concern:

Be it known that I, FRANK L. CAPPS, a citizen of the United States, residing at Newark, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Processes of Forming Duplicate Sound-Records, of which the following is a specification.

The object of my invention is to economically produce and duplicate sound-records.

There are two methods of duplicating sound-records now commonly employed. The first of these methods is the mechanical method, carried out by a suitable duplicating-machine provided with reproducing and recording styli, which respectively follow the record-groove of a rotating master-record and cut a duplication of the record in a correspondingly supported and operated blank. This mechanical method produces a satisfactory duplicate; but a single master-record can be used only a limited number of times, making the cost of the duplicates proportionately large. The other method which is commonly practiced consists in electroplating a master-record, then by suitable means removing the master-record from the electroplate, which forms a cylindrical matrix, backing up the matrix and supporting it in a hot-water or steam warming-jacket, then putting a blank of the proper size within the cylindrical matrix, supporting it therein until it becomes slightly softened by the heat of the surrounding jacket, and then applying a mandrel or former to the softened blank and forcing it into intimate contact with the matrix-surface of the electroplate, and finally removing the electroplate-matrix with attached blank and cooling in a refrigerator to cause the blank to contract so that it may be removed from the matrix. This process also produces satisfactory results, but is a long and tedious process, requiring skilled labor, and although less expensive than the mechanical method this electroplating method is not altogether satisfactory.

My present invention is distinguishable from the above-described processes and the matrices and blanks produced thereby in that my process is a "wet" process or "dipping" process of producing sound-records and my

matrices and records are formed in or upon films resulting from the evaporation of a solution of a suitable material.

Broadly considered, my improved process consists in first forming a duplicating-matrix by dipping a master-record in a solution of a suitable material or flowing the solution upon the master-record or otherwise bringing the solution (in a fluid or semifluid state) into intimate contact with the record, then removing the master-record from the matrix, and finally impressing a suitable material into the matrix or electroplating the film-matrix or dipping the matrix into a solution of a desired material or otherwise bringing the solution (in a fluid or semifluid state) into intimate contact with the matrix for the purpose of forming a record. The record so produced is detached from the matrix and may be mounted upon a suitable backing, if necessary, for strength. The duplicating-matrix may be used over and over again an unlimited number of times, as there is practically no wear upon it in making the records.

More specifically, my improved process consists, preferably, in forming a duplicate record by dipping the master-record in or otherwise coating it with a fluid solution of some suitable material, such as gelatin, then allowing the coated record to cool and dry, the gelatin or other suitable material forming a tough and elastic film-matrix upon the master-record, then breaking or otherwise removing the master-record from the matrix formed by the film of hardened gelatin or other material, then dipping the gelatin matrix into the fluid solution of a suitable material, such as celluloid, (or applying to the matrix a backing-sheet of celluloid paper or other material coated with celluloid solution or other impressible material,) then allowing the same to dry, and finally separating the celluloid-film record from the gelatin matrix and applying a suitable strengthening backing to it.

If desired, the celluloid duplicate may be employed as a master-record, from which duplicates are cut upon the ordinary blanks of commerce in the usual way with a mechanical duplicating-machine.

When the commercial water solution of gelatin is employed in the formation of the ma-

trix from the master-record, it is necessary in making the duplicate record therefrom to employ a material which will not affect the gelatin—such, for instance, as an alcohol and ether solution of celluloid or an easily-fusible composition of wax and rosin. If the gelatin is rendered waterproof by the addition of bichromate of potash and exposure to the sun, many more materials—such as water-glass, plaster-of-paris, starch, and other material having water in their composition—become available for use in forming the duplicate records and the scope of the invention thereby greatly enlarged.

My invention consists, further, of the improved film-matrix and the improved film-record formed from solutions of suitable materials, as hereinafter more particularly pointed out.

My invention consists of further features of improvement ancillary to the above-mentioned main features, and in order that my invention may be fully understood I will first describe the same with reference to the accompanying drawings and afterward point out the novelty with more particularity in the annexed claims.

In said drawings, Figure 1 is a longitudinal sectional view of a cylindrical master-record formed in the usual way upon a sound-recording machine. Fig. 2 is a similar view showing the master-record with its attached gelatin-film matrix formed by dipping the master-record in a fluid gelatin. Fig. 3 is a detail sectional view of the gelatin-film matrix detached from the master-record by breaking or otherwise removing the master-record. Fig. 4 is a similar view representing the gelatin-film matrix with the attached celluloid-film record formed by dipping the matrix in a solution of celluloid or otherwise forming the celluloid or other material therein. Fig. 5 is a detail view of a separated celluloid-film record. Fig. 6 is a similar view representing the film-record having a suitable backing fitted within it, the backing being shown as made of a suitable material molded into the film-record.

The original or master record 1, formed in the usual way upon a sound-recording machine, is dipped in a solution of gelatin to form a gelatin-film matrix 2 upon its record-surface. The record may be dipped a sufficient number of times to form a film of the desired thickness, the coating being allowed to cool and partly evaporate and dry between the dippings. The master-record, with attached film-matrix 2, is then put aside to dry for about twelve hours, when the film of gelatin will assume a hard horny aspect. The film-coated master-record is then taken in the hand and with a steel bar or other suitable instrument is given two or three sharp blows to crack the master-record within the film-matrix, when the pieces of the master-record will readily fall out, leaving a film-matrix with a perfect clear-cut negative record upon its in-

ner surface. The film-matrix 2, formed as just described, is then taken and dipped in a solution of suitable material, such as celluloid, it being dipped a sufficient number of times to produce a film-record 3 of the proper thickness. This coated matrix is then allowed to dry, and the celluloid-film record 3 will be readily detachable from the matrix. In making the solution of celluloid for producing the film-record I may add a proper quantity of a suitable material to cause the solution to contract in drying, so as to cause the film to be separated from the matrix and facilitate its removal.

In place of dipping the film-matrix in a solution of celluloid I may take a sheet of celluloid and coat its surface with a celluloid solution and impress the surface coated with the semifluid material against the matrix-face of the film-matrix, the jointed ends of the celluloid sheet being cemented by the celluloid solution and the ridge or uneven portion of the joint pressed out against the matrix. The matrix, with celluloid impressed upon, it is then allowed to dry, and the evaporation or drying out of the alcohol and ether of the celluloid solution forms a vacuum between the celluloid sheet and matrix and causes the celluloid to closely adhere to the matrix and faithfully reproduce the record thereof. When the celluloid and its film-coated surface have become perfectly dry, so as to form practically an integral cylindrical record within the matrix-cylinder, I separate the celluloid record from the matrix by bending the celluloid record inwardly away from the matrix at different points and then partially collapsing the record to allow it to be withdrawn from the matrix. This bending and collapsing of the celluloid record within the matrix does not injure the record, because of its elastic nature.

In place of the use of celluloid for the record I may employ a mixture of beeswax and rosin. The ordinary record of commerce is made up of stearic acid, aluminium or a suitable salt of aluminium, and caustic potash fused together into an intimate mass, which is molded into the desired shape. This material has a very high melting-point and could not be molded in a matrix of gelatin formed according to my process, as the heat of the material in a fluid state would melt the record upon the gelatin matrix. I have discovered that a mixture of rosin and beeswax can be kept in fluid state at a very low temperature—lower, in fact, than the beeswax alone—and as the rosin tempers the wax and removes its objectionable viscous quality I am able to form a very satisfactory record of this material. The mixture of rosin and beeswax in about equal proportions is flowed into the gelatin-film matrix or the matrix is dipped into the fluid mixture and the mixture forms upon the matrix, as in the use of the semifluid solution of celluloid. The beeswax-and-rosin record is allowed to dry and harden, and in

drying it contracts and separates from the film-matrix and can readily be removed.

If desired, a suitable paper backing may be coated with a film of celluloid or other suitable record-forming solution and the semi-fluid film-surface impressed against the matrix to form the phonographic record. The paper backing may be in any preferred shape to suit the machine for which the record is prepared.

Any other material suitable for the body of the record may be covered with the impressible fluid or semifluid material and a record impressed upon it, as above described, without departing from the spirit of my invention.

One disadvantage in the use of the ordinary commercial solution of gelatin in forming the matrices is that the gelatin is soluble in water, and therefore materials having water in their composition cannot be employed to form the records. To avoid this objection, I propose to render the gelatin solution waterproof by mixing with the solution a suitable quantity of bichromate of potash and then exposing the mixture to the sun. As is well known, this will produce a waterproof gelatin solution. With the matrix formed of this waterproof gelatin it is possible to use many materials, such as silicate of soda, plaster-of-paris, starch, and other materials which contain water. The waterproofing of the gelatin greatly broadens the scope of my invention, as many materials become available for making the records which could not otherwise be used.

The record formed as above described may or may not be of sufficient strength in itself to withstand the wear and tear to which a record is subjected. If the record is a mere film, as when made of celluloid solution, it is necessary to strengthen it by providing it with a suitable backing. This backing may be a properly-shaped paper form or it may be plaster-of-paris or other material, and is molded into the film-record around a suitable mandrel or former. In Fig. 6 I have shown the film-record upon a backing 4 of molded material, such as plaster-of-paris.

It will of course be understood that I do not limit myself to any particular shape of record, my invention being equally applicable for making a cylindrical or a flat record.

In using the term "dipping" I mean to cover flowing the fluid coating material upon the matrix or record surface, immersing the matrix or master-record in the coating material, or otherwise covering the matrix or record surface with the impressible fluid or semifluid material.

As above stated, the record may be made from the film-matrix by electroplating in the usual well-known way without departing from the spirit of my invention.

I would have it understood that those claims employing such expressions as "bring-

ing a solution of a suitable material into contact with the matrix (or record) surface" are intended to cover the use of a suitable material in any impressible state, whether fluid or semifluid and whether the material is applied direct to the matrix or record or is first applied to a backing or body material and afterward brought into contact with the matrix or record.

Having thus described my invention, what I claim as new therein, and desire to secure by Letters Patent, is—

1. The herein-described process of producing sound-records, which consists in forming a matrix of the desired record, then coating the matrix with a solution of a suitable material to form thereon a film-record, and finally separating the film-record from the matrix, as set forth.

2. The herein-described process of producing sound-records, which consists in forming a matrix of the desired record, then dipping the matrix in a solution of a suitable material, then allowing the coated matrix to dry to form upon the matrix a film-record, and finally separating the film-record from the matrix, substantially as set forth.

3. The herein-described process of forming matrices of sound-records, which consists in coating a master-record with a solution of a suitable material and allowing it to dry thereon to form upon the master-record a film-matrix, and then removing the master-record, as set forth.

4. The herein-described process of forming matrices of sound-records, which consists in dipping a master-record in a solution of a suitable material, allowing the coated master-record to dry, and finally removing the master-record from the film-matrix, substantially as set forth.

5. The herein-described process of duplicating sound-records which consists in coating a master-record with a solution of a suitable material and allowing it to dry to form upon the master-record a film-matrix, then removing the master-record from the film-matrix, and finally forming a suitable material in the film-matrix and removing the matrix from the duplicate record thereby produced, substantially as set forth.

6. The herein-described process of duplicating sound-records, which consists in dipping or flowing a suitable coating material upon a master-record, allowing the same to dry and harden upon the record, then removing the master-record from the matrix thus formed, and finally forming a duplicate record in or upon the matrix, substantially as set forth.

7. The herein-described process of duplicating sound-records, which consists in dipping a master-record in a solution of a suitable material, thereby forming a film-matrix upon the master-record, next removing the master-record from the film-matrix, then dipping the film-matrix in a solution of suitable material

to form a film-record thereon, then separating the film-record from the matrix; substantially as set forth.

8. The herein-described process of duplicating sound-records, which consists in dipping a master-record in a solution of gelatin and allowing it to dry, thereby forming a film-matrix upon the master-record, next breaking or otherwise removing the master-record from the film-matrix, then dipping the film-matrix in a solution of celluloid and allowing it to dry, forming a film-record upon the matrix, then separating the film-record of celluloid from the matrix, substantially as set forth.

9. The herein-described process of duplicating sound-records, which consists in dipping a master-record in a solution of gelatin and allowing it to dry, thereby forming a film-matrix upon the master-record, next breaking or otherwise removing the master-record from the film-matrix, then dipping the film-matrix in a solution of celluloid and allowing it to dry, forming a film-record upon the matrix,

then removing the film-record of celluloid from the matrix, and finally mounting it upon a suitable backing, substantially as set forth.

10. The herein-described process of duplicating sound-records which consists in dipping a master-record in a waterproof solution of gelatin, then removing the master-record from the film-matrix formed upon the same and finally forming a duplicate record in the waterproof gelatin matrix and removing the record thus formed from the matrix, substantially as set forth.

11. As an article of manufacture, a sound-record consisting of irregularities corresponding to sound-waves, the same being molded upon a horny surface formed by the evaporation of a solution upon a suitable matrix-surface, substantially as described.

FRANK L. CAPPS.

Witnesses:

A. B. C. SALMON,
N. CARTER.



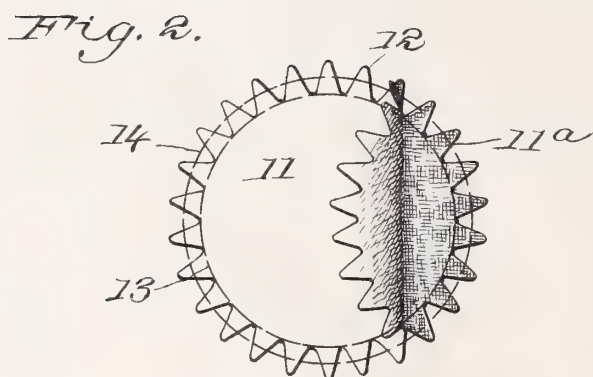
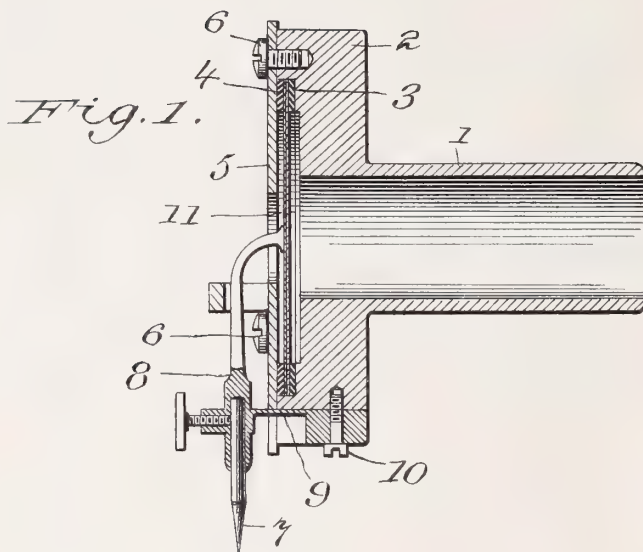
No. 666,716.

Patented Jan. 29, 1901.

L. P. VALIQUET.
DIAPHRAGM FOR SOUND BOXES.

(Application filed June 1, 1899.)

No Model.)



WITNESSES:

Wm. M. Pratt.

W. H. Pumphrey.

INVENTOR

Louis P. Valiquet

BY

A. Parker Smith

ATTORNEY

UNITED STATES PATENT OFFICE.

LOUIS P. VALIQUET, OF NEW YORK, N. Y., ASSIGNOR TO THE UNIVERSAL TALKING MACHINE COMPANY, OF SAME PLACE.

DIAPHRAGM FOR SOUND-BOXES.

SPECIFICATION forming part of Letters Patent No. 666,716, dated January 29, 1901.

Application filed June 1, 1899. Serial No. 718,943. (No model.)

To all whom it may concern:

Be it known that I, LOUIS P. VALIQUET, a citizen of the United States of America, and a resident of New York city, county of New York, State of New York, have invented certain new and useful Improvements in Diaphragms for Use in Sound-Boxes, of which the following is a specification.

My invention relates to sound-reproducing apparatus, and is more specifically designed to produce an improved form of diaphragm for use in sound-boxes on talking-machines for recording or reproducing sounds mechanically.

The preferred form of apparatus embodying my invention is illustrated in the accompanying sheet of drawings, in which—

Figure 1 is a longitudinal section of a sound-box embodying my invention. Fig. 2 is a detail view of one form of diaphragm.

Throughout the drawings like reference-figures refer to like parts.

The body of the sound-box consists of a tube 1, with a flange 2 recessed on its outer face in the usual manner. Within this circular recess are confined the washers 3 4 of any suitable material—leather, rubber, or the like—and these are held in position by an annular face-plate 5 of any convenient shape and material, said face-plate being fastened to the flange 2 of the sound-box by screws 6 6 or otherwise.

A reproducing-needle 7 is carried in a reproducer-arm 8, mounted on the spring-plate 9, fastened to the body of the reproducer by the screw 10. Of course any equivalent mounting could be substituted for that shown. The inner end of the reproducer-arm 8 rests against the diaphragm 11, which in my invention is made with serrated edge 12. These serrations may be of any convenient form, but preferably of the triangular shape shown. The serrations 12 are firmly held between the opposing surfaces of the washers 3 and 4 or other forms of opposing surfaces adapted to be forced together by the clamping action of the face-plate 5 upon the flange 2.

One point of my invention is the holding of the diaphragm 11 by the projecting serrations 12 only and the varying of the action of the diaphragm by varying the amount which

the pressing-surfaces overlap said serrations. If a stiff diaphragm is desired, the washers 3 and 4 or other equivalents are caused to overlap the entire portion of the serrations down to the broken line 13, Fig. 2. If more flexible diaphragm action is required, the opposing surfaces are caused to overlap only a portion of said serrations—as, for instance, down to the broken line 14 or some other point selected to produce the desired adjustment of the diaphragm. The diaphragm when cut in this form may be made of a variety of materials; but I prefer to make it of linen or equivalent textile or parchment-like fabric. A single thickness may be used or the diaphragm may be built up to a plurality of thicknesses, the adjacent sheets being held together by an intervening layer of adhesive material, such as fish-glue. In Fig. 2 such a construction is shown, one of the sheets 11^a being left flat, while the upper sheet 11 is rolled back partly. Various forms of linen fabric may be employed; but I find the best results to be produced by the use of the ordinary linen tracing-cloth, which may be first soaked to partly remove the sizing with which it is treated to fit it for use as a tracing material.

The mode of operation of my invention is of course evident from the foregoing description.

The diaphragm being preferably built up of several sheets of linen with intermediate layers of fish-glue or said diaphragm being formed of other materials, the same is cut or stamped in the form shown in Fig. 2 and the serrated edges are grasped between the opposing surfaces of the washers 3 and 4 or other adjustable surfaces, which are forced together by the clamping action produced by assembling the parts of the reproducer. The reproducer-arm 2 is then adjusted in position with its inner end bearing on the center of said diaphragm and the sound-box is complete and ready for use.

The advantages of my invention lie in the great purity of tone produced by it, which is entirely free from the ordinary metallic sound of sound-reproducing apparatus, in the cheapness of the resulting construction, the necessity of using mica or other high-priced material being avoided and the use of cheap leather

washers being possible in place of washers of high-priced material usually necessary, in the non-liability of the diaphragm to be affected by climatic changes or age, and in the ease of adjustment of said diaphragm as to flexibility by simply varying the amount by which the opposing surfaces of the holding-rings overlap the serrations at the edge of the diaphragm.

It is evident, of course, that various changes could be made in the details of construction shown without departing from the spirit and scope of my invention so long as the principle of operation or the relative shape and arrangement of parts is preserved. Various other materials might be used for the diaphragm and the shape of serrations might be varied. Other constructions of holding-rings might be substituted for the loose washers and 4 and other means of clamping said holding-rings might be employed; but all these I consider changes in form and not of substantial variations from my invention.

Having therefore described my invention,

what I claim as new, and desire to protect by Letters Patent, is—

1. A diaphragm for talking-machines having a serrated edge composed of saw-shaped teeth of the material composing the body of the diaphragm.

2. The combination of a sound-box having opposing diaphragm-retaining surfaces, a diaphragm having serrated edges projecting between said opposing surfaces, and means for clamping the surfaces down upon the serrated edges of the diaphragm.

3. The combination of a sound-box having opposing diaphragm-retaining surfaces, a diaphragm of textile fabric having serrated edges projecting between said opposing surfaces, and means for clamping the surfaces down upon the serrated edges of the diaphragm.

Signed by me at New York city this 20th day of May, 1899.

LOUIS P. VALIQUET.

Witnesses:

LILIAN FOSTER,

ERNEST O. CLAPP.



No. 666,819.

Patented Jan. 29, 1901.

J. K. REYNARD.

PERMANENT COPY OF SOUND RECORDS OR THE LIKE.

(Application filed Feb. 5, 1900.)

(No Model.)

3 Sheets—Sheet 1.

Fig. 1

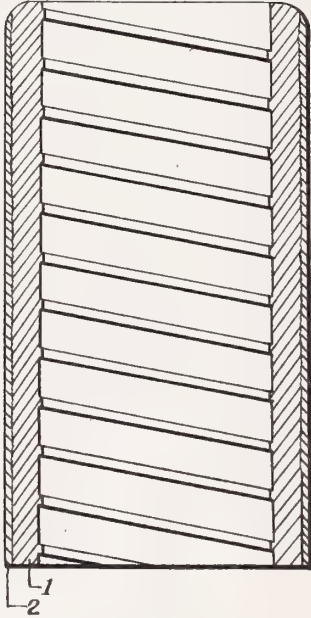


Fig. 2.

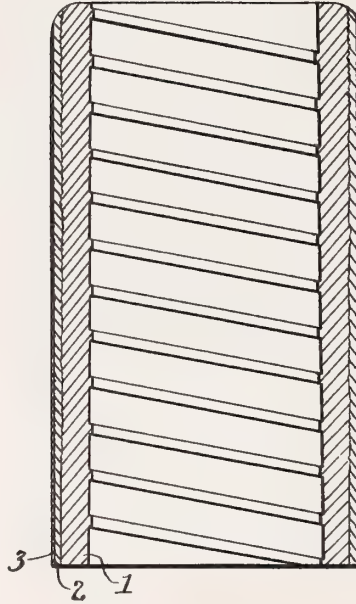


Fig. 3.

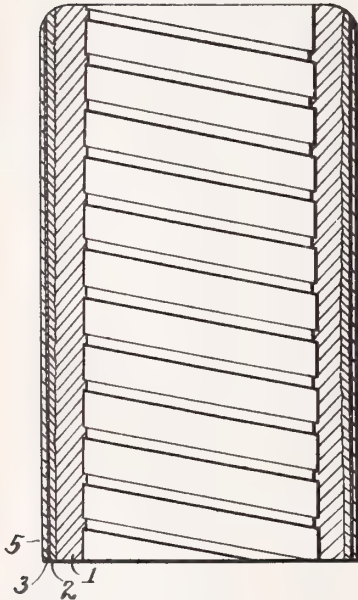
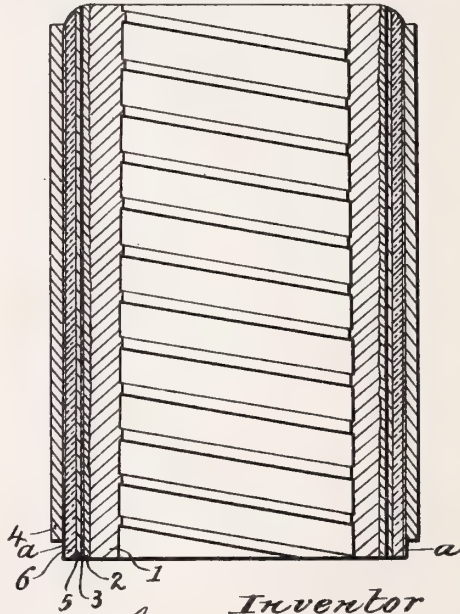


Fig. 4.



Witnesses
W. R. Edlin.

John J. Ford

Inventor

James K. Reynard
by *Philip Hamer*
his attorney



No. 666,819.

Patented Jan. 29, 1901.

J. K. REYNARD.

PERMANENT COPY OF SOUND RECORDS OR THE LIKE.

(Application filed Feb. 5, 1900.)

(No Model.)

3 Sheets—Sheet 2.

Fig. 5.

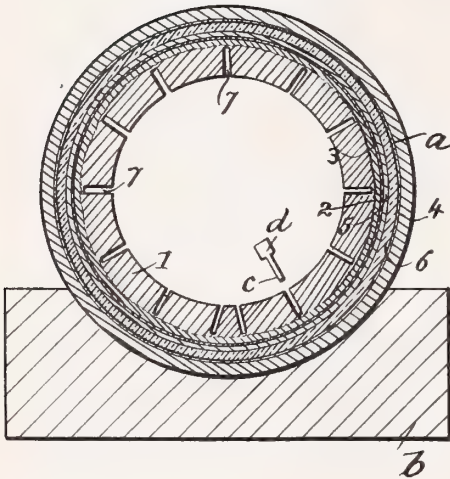


Fig. 6.

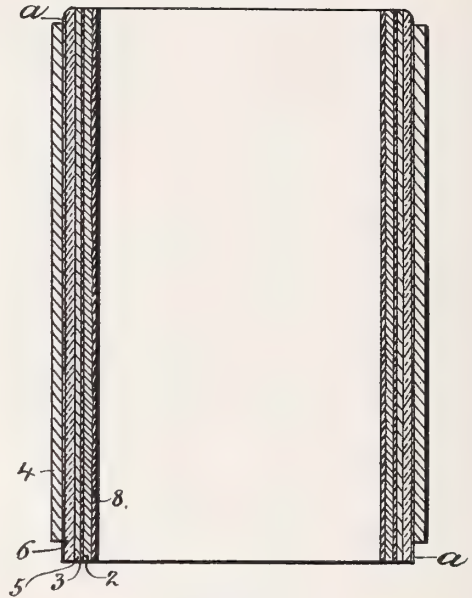


Fig. 7.

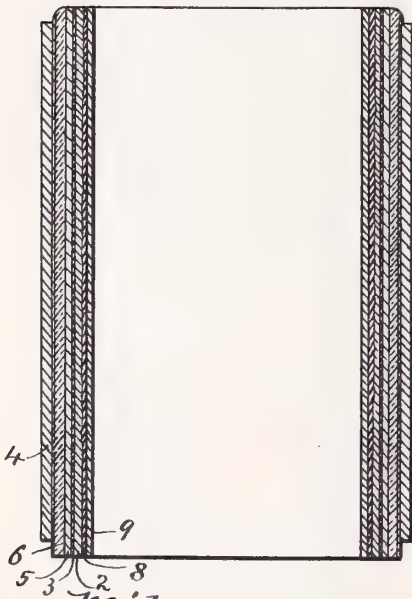
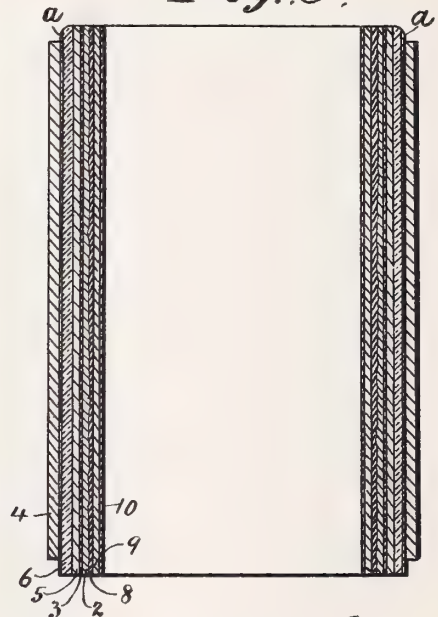


Fig. 8.



Witnesses.
W. R. Edgell
Fred L. Lurie

Inventor.
James K. Reynard
by Philip L. Lurie
his attorney



J. K. REYNARD.

PERMANENT COPY OF SOUND RECORDS OR THE LIKE.

(Application filed Feb. 5, 1900.)

(No Model.)

3 Sheets—Sheet 3.

Fig. 9.

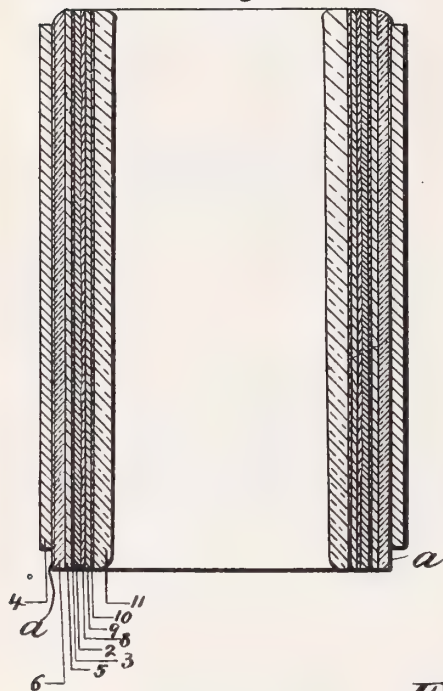


Fig. 11.

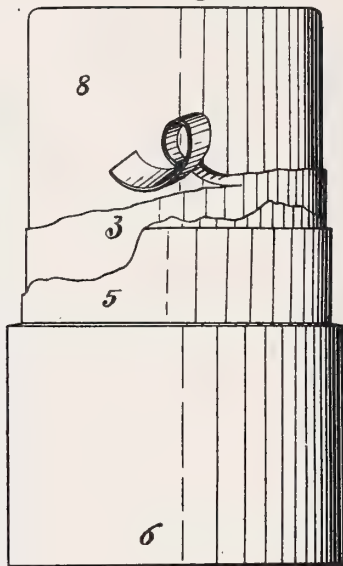
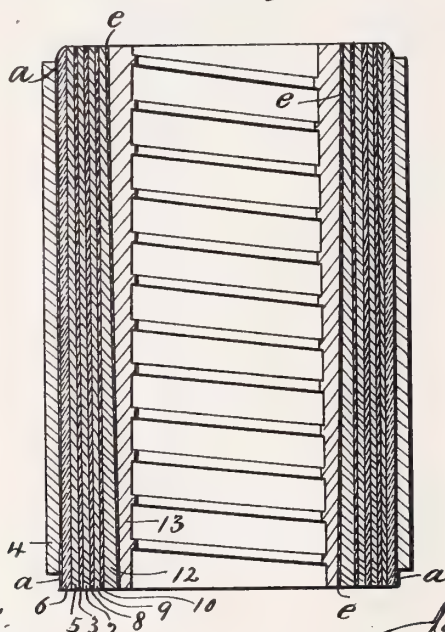


Fig. 10.



Witnesses.

W. R. E. Gilm.

John F. Furi

Inventor.

James K. Reynard
by *Philip Kamo*
his attorney

UNITED STATES PATENT OFFICE.

JAMES K. REYNARD, OF NEWARK, NEW JERSEY, ASSIGNOR TO THE
AMERICAN GRAPHOPHONE COMPANY, OF WASHINGTON, DISTRICT
OF COLUMBIA.

PERMANENT COPY OF SOUND-RECORDS OR THE LIKE.

SPECIFICATION forming part of Letters Patent No. 666,819, dated January 29, 1901.

Application filed February 5, 1900. Serial No. 4,004. (No specimens.)

To all whom it may concern:

Be it known that I, JAMES K. REYNARD, of Newark, New Jersey, have invented a new and useful Improvement in Permanent Copies of Sound-Records or the Like, which is fully set forth in the following specification.

This invention relates to permanent or indestructible copies of surfaces containing minute irregularities, such as sound-records; and it consists in the employment of certain steps that are of great advantage in producing such copies commercially, and particularly in the method of building up a substantial yet faithful matrix, in building up a substantial celluloid structure containing the permanent copy, and in the improved matrix and permanent copy produced by the novel steps of my improved process.

Briefly stated, the new process is as follows:

The matrix is first formed in any approved manner, but preferably as hereinafter described. It is then mounted, preferably in a manner to be described, for convenience in handling, after which it is separated from the master. The permanent or indestructible copy is then formed by first coating the surface of this matrix with a thin film of liquid or semiliquid celluloid, which ultimately constitutes the outer surface of the permanent copy, next placing on this celluloid film when dry a film of some suitable adhesive material, such as chromatized gelatin, and then coating the surface of this adhesive film with a second celluloid film. These alternate steps may be repeated, if desired. A convenient support or backing may be supplied to this built-up structure, and the matrix and its mounting are finally removed.

The application of this invention is not limited to any particular shape of article to be copied, but will be described at length as applied to producing a permanent copy of the ordinary cylindrical sound-record for graphophones, (or phonographs.) It will be best understood by reference to the accompanying drawings, in which—

Figures 1 to 10 are sectional views, and Fig. 11 an elevation, illustrating the successive steps and showing the films or layers considerably exaggerated.

The matrix is by preference formed as follows: I first coat the master 1 with a thin film 2 of some suitable material that will not injuriously affect the material of which the master is composed and that can receive and retain a true copy in reverse of the minute irregularities to be copied. I prefer a solution of gelatin, preferably chromatized gelatin. This coating is allowed to dry gradually and evenly, so as to leave a uniform film 2 over the whole surface to be copied. (See Fig. 1.) This constitutes the true matrix and is a hard horny film of great toughness. When this film 2 is thoroughly dry, it is exposed to the sunlight, which gives it a somewhat-clouded appearance, the actinic rays hardening it. The matrix has then to be supplied with a mounting. Where gelatin is used, I find it convenient to coat the gelatin film with a varnish, as shellac 3, (see Fig. 2,) and when this coat 3 is dry I apply a coating of some suitable material, such as wax, hereinafter referred to, after which the whole structure is fitted with a metal holder 4 for convenience in handling. (See Fig. 4.) The shellac serves a threefold purpose. It clasps the gelatin film closely and truly to the surface of the master and prevents it from blistering off and from warping or wrinkling when removed from the master, the alcohol in the shellac affects the gelatin film, rendering it slightly elastic and less brittle and liable to crack, and the wax mixture of which the backing for the matrix is preferably formed will adhere to shellac more readily than to the gelatin. A second coat of shellac may be applied, if desired. For a reason to be explained later I find it convenient to apply to the matrix a first coat 5 of fine wax, (see Fig. 3,) and then a thicker layer 6 of a mixture of beeswax and rosin in equal proportions. (See Fig. 4.) This outer coat 6 is turned to a true cylinder, wrapped with a strip of paper *a*, Fig. 4, and fitted neatly into a metal cylinder 4. After the complete matrix is thus built up the original master is broken away or otherwise removed. This may be done conveniently, as shown in Fig. 5, by cutting from the interior of the original master grooves 7, that reach nearly but

not quite through its wall to the matrix. For this purpose I place the metal cylinder containing the master and the complete matrix in a seat *b* to prevent it from slipping and then use a saw whose cutting portion *c* is much thinner than its back *d* and is of a depth less than the thickness of the wall of the original master, the rib *d* preventing it from cutting too deep, so as to injure the matrix. I cut upon the inner side of the master two adjacent grooves, so as to remove a V-shaped piece. This "keystone" being thus removed, I saw other grooves on either side of this notch and readily remove the intervening portions of the wall of the original master, taking care to brush off all particles of dust, &c., from the matrix-surface. This matrix is now available for producing copies, permanent or otherwise, in any desirable manner from any suitable material.

One of the purposes of the present invention is to produce a celluloid copy more substantial than those hitherto produced.

If a sheet of ordinary celluloid be softened, as by steam, and pressed against the matrix, it tends to break down the minute irregularities to be copied, and small particles of foreign matter or even of air would prevent the celluloid from entering into intimate connection and receiving a true copy, and, besides, the heat would in many cases affect the matrix. If celluloid in a solution be flowed upon the surface of the matrix to an appreciable thickness, the volatile medium (ether or alcohol) evaporates so rapidly that an outer crust is formed, while the inner mass retains its semi-fluid consistency for a long time and ultimately dries with great unevenness, forming a spongy porous structure. The last portion to dry is that next the matrix, which should form the true record-surface, and under these circumstances it presents a pitted "small-pox" appearance, and finally it has been found impracticable to build up a celluloid structure by repeated deposits of film, for the reason that as each deposit dries the film so formed draws away from the one beneath it for want of sufficient cohesion. I therefore proceed as follows: I first flow over the surface of the matrix 2 (or otherwise apply, as by dipping) a solution of celluloid, (preferably with a suitable thinner, such as the ordinary cement filler sold on the market, being about a one-per-cent. solution of celluloid,) forming an exceedingly-thin film 8, Fig. 6, which eventually constitutes the outer or record surface of the permanent copy. This film 8 is so infinitesimally thin and delicate that it bears on its exposed face (away from the matrix) a practical duplicate of the irregular surface of the matrix. In other words, its thickness is less than the height or depth of the minute irregularities to be copied. After it is thoroughly and evenly dried this celluloid film 8 is coated with a film 9 (see Fig. 7) of some suitable adhesive material that can be handled readily, (preferably a so-

lution,) that will adhere faithfully to celluloid, and that has substantially the same coefficient of expansion as celluloid. The chroma-70
tized-gelatin solution has all these properties and may be advantageously used. This second or adhesive film 9 is almost as thin as the celluloid film 8, bearing on its exposed face to some extent a reproduction of the75
matrix. I then flow the celluloid solution (this time by preference somewhat stronger—say a ten-per-cent. solution) on the film 9, forming a second celluloid film 10, which is allowed to dry as before. (See Fig. 8.) These alter-80
nate steps may be repeated, if desired. The structure thus built up by alternate films of celluloid and gelatin is practically to all intents and purposes a homogeneous celluloid structure. It may be provided with a back-85
ing in any convenient manner, as by pouring into the cylinder around a central mandrel melted wax, beeswax, rosin, &c., 11, (see Fig. 9) or the interior of the celluloid structure may be coated with a beeswax and rosin mix-90
ture 12, which is reamed out to a predetermined taper, after which an ordinary soap-mixture cylinder 13, turned to the same exterior taper, is wrapped with a blank *e* of95
paper or the like of the proper shape and size and then inserted into the celluloid structure. The beeswax and rosin mixture is best for the filling between the tapered soap-mixture cylinder and the celluloid cylinder, since it is homogeneous, fusing readily at a low tem-100
perature, is easily handled, and has about the same coefficient of expansion as the celluloid. The wrapping *e* prevents friction in inserting the tapered cylinder and if of paper is a non-conductor of heat between the105
soap material and the wax mixture. Last of all the matrix is removed and the permanent copy is finished and ready for use. The metal cylinder 4 is first removed and the paper *e* unwrapped, then the built-up cylinder (see110
Fig. 11) is placed on a mandrel, and the beeswax and rosin coat 6 is turned off with a knife until the lighter-colored fresh wax 5 gives warning that the celluloid is being approached. This layer 5 is pulled off by hand,115
and finally the shellac and gelatin films 3 and 2 are readily peeled off.

In general, all solutions should be strained from impurities and all air-bubbles removed, the article should be of approximately the120
same temperature as the solution that is being applied, and the temperature should remain as uniform as possible throughout the entire process. It is necessary that each film or coating should dry thoroughly and evenly.125
If it dry too fast, it is liable to pull away from the surface beneath it, and if it dry too slowly it may dry unevenly and become warped or wrinkled. An even temperature is more readily maintained by having a warm room.130

When the original that is to be copied is other than a cylinder, of course appropriate changes will be made, as in the shape of the metal holder for the matrix, if one be em-

ployed. Of course the wax backing of the matrix will not be turned to a cylinder, and equally of course the mounting for the celluloid copy will not be made of the tapered cylinder described. I do not limit myself to the exact steps described, as I have merely set forth the best methods. Parts of my invention may be used to the exclusion of other parts without departing from the spirit of my invention.

I claim—

1. The herein-described process of forming a permanent or indestructible copy, which consists in first coating the original master with a solution of some suitable material that can receive and retain a true copy in reverse of the minute irregularities to be copied, then coating this film when dry with a suitable varnish, next providing this varnish with a suitable backing, then removing the original master from the matrix so built up, afterward coating this matrix-surface with alternate films of celluloid solution and of some suitable adhesive substance, next applying a suitable backing for this built-up celluloid structure, and finally removing the matrix, substantially as described.

2. The herein-described process of forming a permanent or indestructible copy, which consists in first coating the original master with a gelatin solution, next coating this gelatin film when dry with shellac, next providing this shellac with a suitable backing as a wax mixture, then removing the original master from the matrix so built up, afterward coating this matrix-surface with a film of a thin celluloid solution, then coating this celluloid film when dry with a thin film of gelatin solution, next applying a second celluloid film to the gelatin film, then applying a suitable backing for this built-up celluloid structure, and finally removing the matrix, substantially as described.

3. The method of forming a permanent copy, consisting of depositing on a suitable matrix alternate films produced thereon by the evaporation of a celluloid solution and a solution of some suitable adhesive material, and then applying a suitable backing to support this built-up celluloid structure, substantially as described.

4. The method of forming a matrix or reverse copy, consisting of first forming on the surface to be copied a film resulting from the evaporation thereon of some suitable material, next varnishing this film, and then applying to the varnish a suitable backing, substantially as described.

5. The method of forming a matrix or reverse copy, consisting of first forming on the surface to be copied a film resulting from the evaporation thereon of a solution of chromatinized gelatin, next applying to this film a coating of shellac, and then applying to the shellac a suitable backing as a wax mixture, substantially as described.

6. The method of building up a permanent or indestructible copy of a sound-record or the like, consisting in first applying to the surface to be copied a thin solution of celluloid, next applying to this celluloid film when dry a solution of some suitable adhesive material as chromatized gelatin, and then applying to this adhesive film when dry a stronger solution of celluloid and letting it dry, substantially as described.

7. The method of building up a permanent or indestructible copy of a sound-record or the like, consisting in first applying to the surface to be copied a solution of celluloid, next applying to this celluloid film when dry a solution of some suitable adhesive material, and then applying to this adhesive film when dry a solution of celluloid and letting it dry, substantially as described.

8. The herein-described matrix, consisting of a film of gelatin, a backing of some suitable material, and an interposed layer of varnish uniting them, substantially as described.

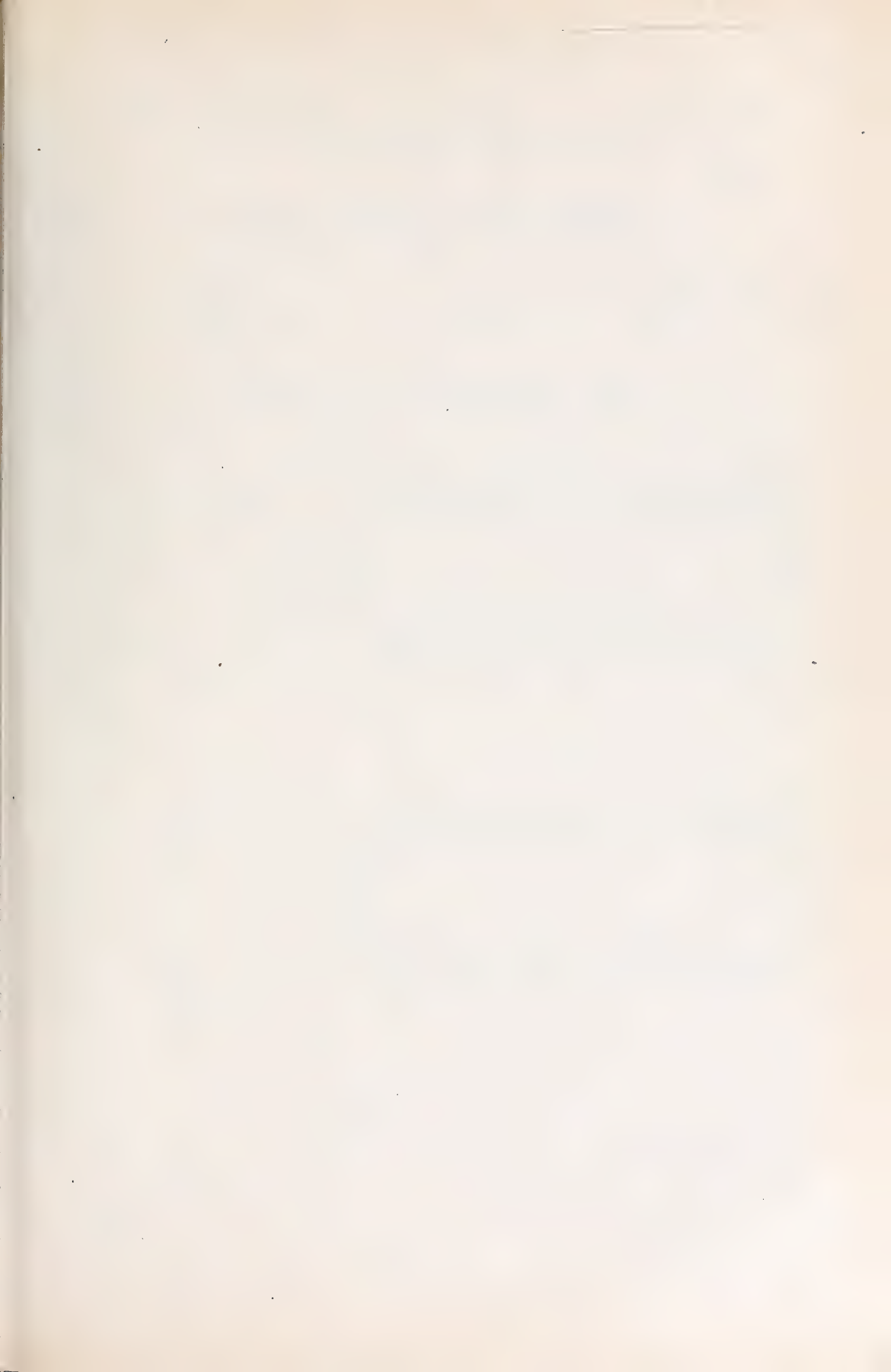
9. The herein-described built-up celluloid sound-record, the same consisting of alternate films of celluloid and of a suitable adhesive material, and containing on its outer surface irregularities corresponding to sound-waves.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

JAMES K. REYNARD.

Witnesses:

VICTOR H. EMERSON,
FRANK L. CAPPS.



No. 666,937.

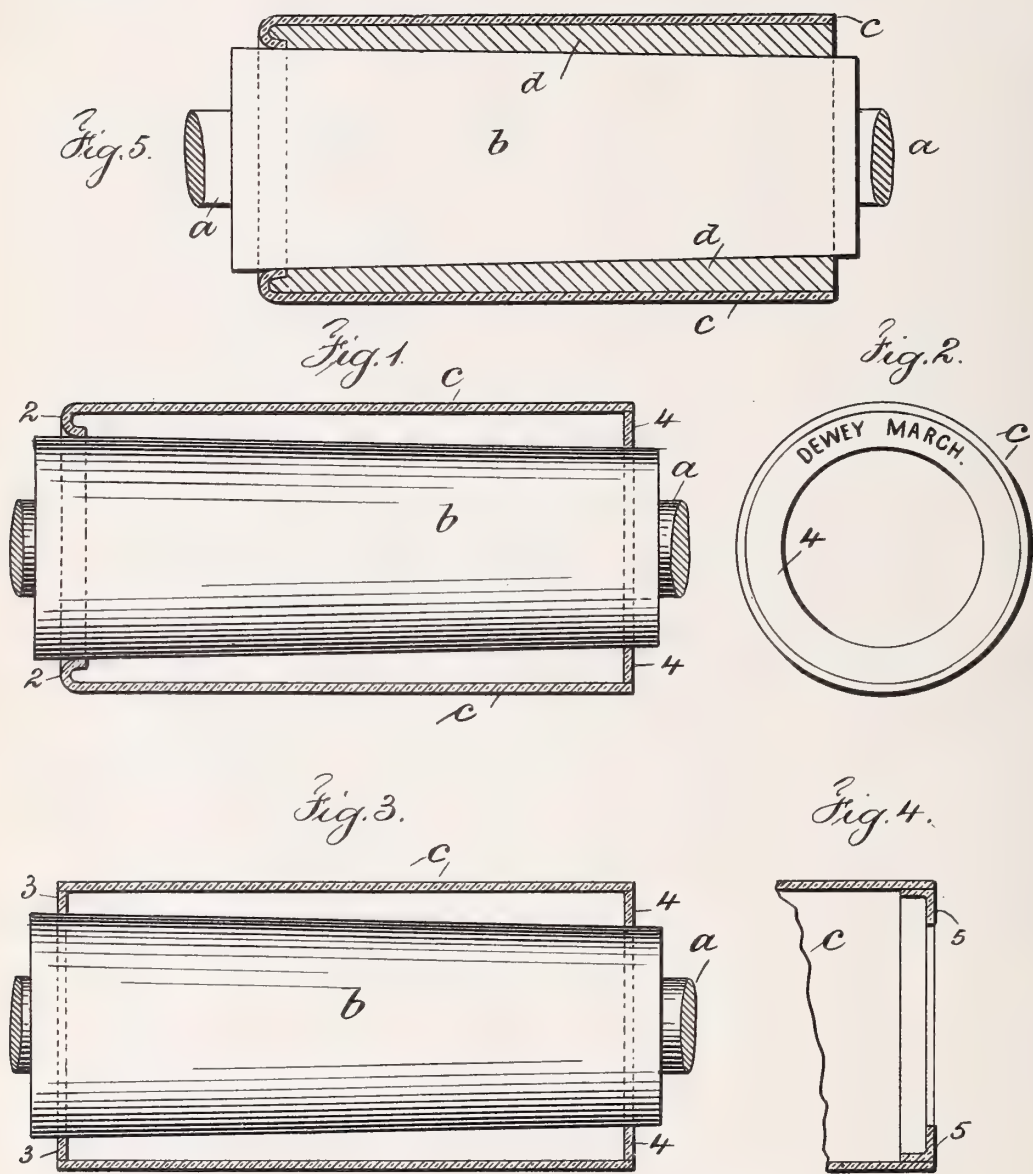
Patented Jan. 29, 1901.

A. N. PETIT.

PHONOGRAPH RECORD CYLINDER OF CELLULOID.

(Application filed Apr. 19, 1900.)

(No Model.)



Inventor

Witnesses

Chas. H. Smith
J. Staib

Ademor N. Petit.

for L. W. Lurell & Son

attys

UNITED STATES PATENT OFFICE.

ADEMOR N. PETIT, OF NEWARK, NEW JERSEY.

PHONOGRAPH RECORD-CYLINDER OF CELLULOID.

SPECIFICATION forming part of Letters Patent No. 666,937, dated January 29, 1901.

Application filed April 19, 1900. Serial No. 13,425. (No model.)

To all whom it may concern:

Be it known that I, ADEMOR NAPOLEON PETIT, a citizen of the United States, residing at Newark, in the county of Essex and State of New Jersey, have invented a new and useful Improvement in Phonograph Sound-Record Cylinders of Celluloid, of which the following is a specification.

My present invention is designed as an improvement upon the device shown and described in Letters Patent No. 657,956, granted to me September 18, 1900. In the device of this patent the ends of the celluloid cylinder were integral and bent inward and provided with openings of varying sizes to fit the taper mandrel of the phonograph or reproducing-machine. In this device there was liability of the cylinder springing in cutting the record or of the same getting slightly out of shape in the preparatory treatment or after drying.

My present invention is a new article of manufacture; and it consists of a celluloid cylinder or sound-record for phonographs or similar machines adapted to fit the mandrel of the machine and formed from a tube of celluloid, with one end reduced from the diameter of the tube and with the other end provided with an inserted ring and said ring held in place and supported by the cylinder. These celluloid cylinders are comparatively thin, and between the same and the mandrel of the phonograph or record-reproducing machine there is an appreciable space. In making these celluloid cylinders a tube of celluloid of the desired thickness and size is cut up into sections and one end is prepared to fit the larger diameter of the taper mandrel. This is preferably done by returning the end inward, or, in other words, by forming an integral inturned end with an opening of the desired diameter. This may also be done by fitting therein a ring cut from a flat sheet, the periphery of the ring and the inner surface of the cylinder being connected by a solvent of celluloid. The other end is provided with an inserted ring cut from a flat sheet and secured in like manner; but before this ring is inserted the surface of the celluloid is to be treated to render the same plastic to permit the record to be cut thereon. I prefer to employ a sleeve of metal or other

suitable material having a tapered opening fitting the taper mandrel and which sleeve is made true and cylindrical on the exterior surface and adapted to snugly fit within the celluloid cylinder to cause the same to assume a perfectly-cylindrical form and to act as a support therefor during the record-reproducing operation and during the previous treatment and after drying of the cylinder, after which the sleeve is to be removed. The ring to be inserted in the end of the cylinder has the title of the record printed upon one face, and after the removal of the sleeve the ring is inserted and secured to complete the finishing of the record.

In the drawings, Figure 1 is an elevation and partial section representing my improved celluloid cylinder complete upon the taper mandrel of a phonograph or record-reproducing machine. Fig. 2 is an end view of the celluloid cylinder. Fig. 3 is an elevation and partial section representing a modification. Fig. 4 is a partial longitudinal section at one end of the celluloid cylinder, showing a modification; and Fig. 5 is an elevation and partial section representing the filling-in sleeve of metal or other material with the adjacent parts.

The axis or shaft *a* and the taper mandrel *b* of the phonograph or record-reproducing machine are of ordinary construction.

c represents the celluloid cylinder. This may be of any desired thickness, but is usually comparatively thin when compared with the ordinary wax cylinders or records in common use. The celluloid cylinder is of usual diameter, and because of being somewhat thin there is an appreciable space within the same and between the inner surface and the taper mandrel, and to support the said cylinder from the sleeve it is necessary that the ends be provided with openings to receive and frictionally engage the surface of the taper mandrel. I prefer to make the advancing end of the cylinder *c*—that is to say, the end having the larger opening—to fit over the greater diameter of the taper mandrel, with an integral inturned end 2, formed by bending in the celluloid of the cylinder when in a soft condition. These celluloid cylinders are preferably formed by cutting up a tube into sections of the desired length. The advancing

end of the cylinder may, however, be made with an inserted ring 3, the periphery of which is connected to the inner surface of the celluloid cylinder by a solvent material. The
 5 opposite end of the celluloid cylinder is supported upon the taper mandrel at the end of smallest diameter by an inserted ring 4, the periphery of which is preferably connected to the inner surface of the celluloid cylinder
 10 by a solvent material, which acting upon the adjacent surfaces of the celluloid causes the parts to so intimately adhere as to be practically inseparable after the parts have dried. Upon the surface of this inserted ring 4 I
 15 prefer to place the title of the record, as illustrated in Fig. 2. The outer surface of this ring and the end of the celluloid cylinder are made even and flush to produce a finished appearance. This inserted ring may, if desired, be formed with a flange 5, as shown in
 20 Fig. 4, as thereby a greater contacting surface is provided between the periphery of the ring and the inner surface of the celluloid cylinder without departing from the title
 25 function of the ring.

In Fig. 5 I have illustrated at *d* a sleeve of metal or other material having a tapered opening adapted to fit snugly upon the taper mandrel *b* and having a true cylindrical outer surface adapted to fit snugly within the celluloid cylinder *c*. This sleeve is preferably employed in the method of making the phonograph-cylinders, the same acting as a support to the celluloid cylinder and being preferably
 30 inserted before the surface is treated to render the same plastic in order that the style of the reproducing-machine may properly cut into the surface of the celluloid. The sleeve also acts a support during the record making or
 35 cutting operation and thereafter until the celluloid cylinder has dried sufficient to insure the same maintaining its shape, and I prefer to employ this sleeve *d* before the inserted title-ring 4 is put in place in the end of the
 40 cylinder in order to complete the record.

The celluloid cylinder *c* is formed by cutting a tube into sections of the desired length by either forming an inturned end 2 or connecting an inserted ring 3 in the end surrounding the largest diameter of the taper mandrel. 50 The sleeve *d* is then inserted in the celluloid cylinder *c*, the surface is treated to render the same plastic, and the sleeve, with the celluloid cylinder, placed upon the taper mandrel in a reproducing-machine. The record is 55 then cut in this machine upon the surface of the cylinder, after which and when a suitable time has elapsed to insure the cylinder maintaining its perfect form the sleeve *d* is removed, and the inserted title-ring 4, either 60 with or without the flange 5, is placed within the open end of the celluloid cylinder and secured thereto to complete the record, after which the record is adapted to be placed upon the taper mandrel of the phonograph. 65

I claim as my invention—

1. As a new article of manufacture, a celluloid cylinder or sound-record for phonographs or similar machines adapted to fit the mandrel of the machine and formed from a 70 tube of celluloid with one end reduced from the diameter of the tube and with the other end provided with an inserted ring and said ring held in place and supported by the cylinder, substantially as specified. 75

2. As a new article of manufacture, a celluloid cylinder or sound-record for phonographs or similar machines, adapted to fit the mandrel of the machine and formed from an 80 approximately thin tube of celluloid with one end integrally bent inward to contract the opening and with the other end provided with an inserted ring and said ring held in place and supported entirely by the cylinder, substantially as specified. 85

Signed be me this 10th day of April, 1900.
 ADEMOR N. PETIT.

Witnesses:

GEO. T. PINCKNEY,
 S. T. HAVILAND.

No. 667,117.

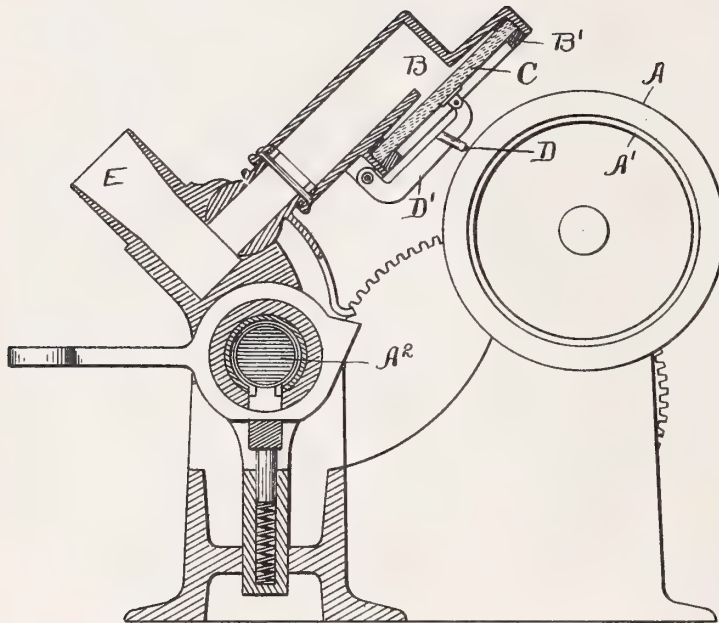
Patented Jan. 29, 1901.

L. E. CURTIS.

PHONOGRAPH.

(Application filed Mar. 25, 1898.)

(No Model.)



WITNESSES:

A. W. Munday
D. B. Barstow,

INVENTOR:

LEWIS E. CURTIS.

BY *Munday, Warts & Adcock.*

HIS ATTORNEYS.

UNITED STATES PATENT OFFICE.

LEWIS E. CURTIS, OF CHICAGO, ILLINOIS.

PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 667,117, dated January 29, 1901.

Application filed March 25, 1898. Serial No. 675,095. (No model.)

To all whom it may concern:

Be it known that I, LEWIS E. CURTIS, a citizen of the United States, residing in Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Devices for Reproducing Sound, of which the following is a specification.

This improvement relates to devices for reproducing sounds.

10 The object of this invention is to improve the quality of the tone obtained in reproducing sound-vibrations by eliminating the "fry" and other "foreign" sounds. It has been devised more particularly for use in talking-machines.

15 I have discovered that a full, clear, and sweet reproduction of sound-vibrations free from all foreign sounds can be obtained by substituting for the diaphragms now in use 20 a non-resonant diaphragm of soft or semisoft material—for example, such as woven or felted cloth. The thickness of the diaphragm may be varied from very thin material to one of considerable thickness. The diaphragm 25 may be made of any soft or semisoft material; but I prefer to use felt and to confine it in the diaphragm-holder without stretching or placing it under tension.

30 In the accompanying drawing I have shown a sectional view of a phonograph or talking-

machine, the reproducer and diaphragm being also in section.

In the drawing, A represents the ordinary cylinder carrying a sound-record, A' its mandrel, and A² the feed-screw for carrying the 35 reproducer B along the record-cylinder A. The reproducer or diaphragm-holder B is of the ordinary construction used in talking-machines in which my improved diaphragm C is clamped by the screw-ring B'. 40

D is the style, and D' the lever carrying the style and which is connected to the diaphragm, so that any vibration given to the style will be conveyed to the diaphragm and the sound reproduced. 45

E is the tip or nozzle for receiving the listening horn or tubes.

What I claim is—

1. A non-resonant diaphragm for reproducing sound-vibrations made of soft or semisoft 50 felted fabric, substantially as specified.

2. A non-resonant diaphragm for reproducing sound-vibrations composed of soft or semisoft material free from tension, substantially as specified.

LEWIS E. CURTIS.

Witnesses:

EDW. S. EVARTS,
D. BARSTOW.

No. 667,202.

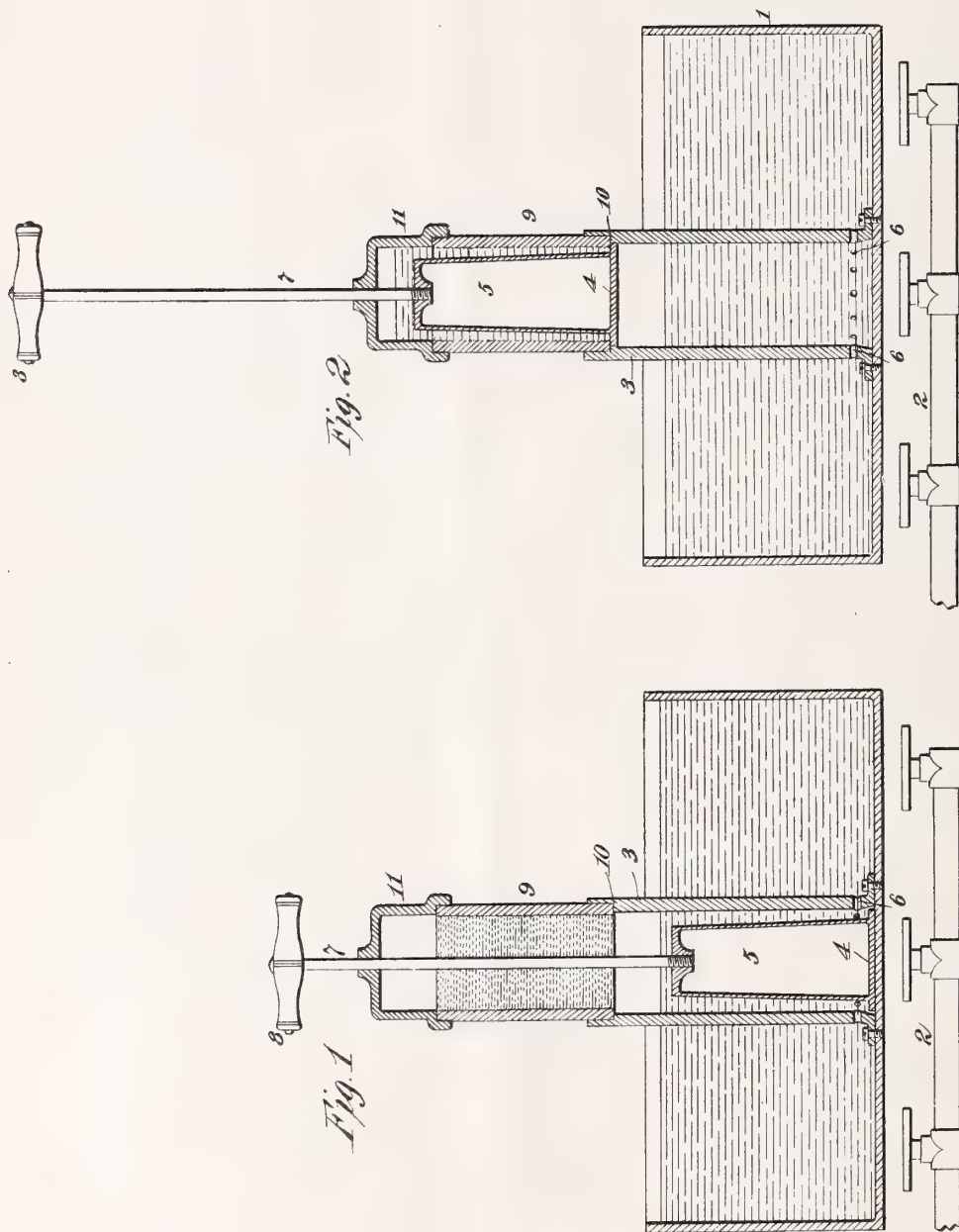
Patented Feb. 5, 1901.

T. A. EDISON.

APPARATUS FOR DUPLICATING PHONOGRAPH RECORDS.

(Application filed May 8, 1900.)

(No Model.)



Witnesses:

*Jas. F. Coleman
 Jno. R. Taylor*

Inventor

*Thomas A. Edison
 by Spencer Edmunds*

Att'y's.

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

APPARATUS FOR DUPLICATING PHONOGRAPH-RECORDS.

SPECIFICATION forming part of Letters Patent No. 667,202, dated February 5, 1901.

Application filed May 8, 1900. Serial No. 15,875. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, a citizen of the United States, residing at Llewellyn Park, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Apparatus for Duplicating Phonograph-Records, (Case No. 1,037,) of which the following is a description.

In my companion application filed on even date herewith (Edison, No. 1,036) I describe an improved process for duplicating phonograph-records, and particularly for the duplicating of cylindrical phonographic records, consisting in forming a mold carrying on its bore the record in negative, in introducing within the mold around a core a molten material the surface of which becomes chilled by contact with the mold, in then permitting the duplicate so formed to contract, in then removing the contracted duplicate and the core from the mold by a direct longitudinal movement, in then separating the core from the duplicate before the latter has contracted sufficiently to prevent such separation, and in finally dressing the ends of the duplicate and in reaming out its interior.

My present application relates to an improved apparatus for the convenient, economical, and effective carrying out of this process; and my object is to provide an apparatus wherein a process of duplicating phonograph-records from a continuous mold can be effectively followed.

In order that my invention may be better understood, attention is directed to the accompanying drawings, forming a part of this specification, and in which—

Figure 1 is a sectional view of a suitable apparatus for the purpose, illustrating the plunger and piston in their lowermost positions; and Fig. 2, a similar view showing the same parts in their elevated positions.

In both the above views corresponding parts are represented by the same numerals of reference.

The apparatus illustrated in the figures is designed for the duplicating of cylindrical phonographic records, and it will be so described; but the applicability of my improved apparatus for the duplication of other varieties of records will be apparent to those skilled in the art.

In the drawings, 1 represents a suitable jar or tank of the proper dimensions and made of any desired material. Within the jar or tank 1 I place the material of which the duplicate records are to be formed and which may be maintained in a molten condition by the application of heat in any way—as, for example, by a gas-tube 2, supplying a number of jets, as shown. The proper level of the molten material is indicated, and this level should be approximately maintained by the addition of fresh material from time to time within the tank, as the liquid material may be withdrawn during the operation. The material in the tank 1 and of which the duplicate records are to be formed may be of any suitable character; but, preferably, it is a metallic soap or a combination of several soaps to which has been added a material not affected by water, such as ceresin, whereby the resulting duplicates will be protected from the effects of atmospheric moisture. Mounted within the tank and secured to its bottom is an open-ended cylinder 3, in which works a piston 4. A tapered core 5 is connected to or formed integrally with the piston 4, and said core is preferably hollow, so as to present a thin wall to the material, whereby the core will very quickly reach the temperature of the molten material when it is immersed therein. A number of openings 6 are formed in the cylinder 3, near the bottom thereof, below which openings the piston 4 passes in reaching its downward position, as shown in Fig. 1, whereby the liquid material may flow through said openings into the cylinder above the piston. Connected to the core 5 is a plunger 7, having an operating-handle 8. The connection between the core and plunger is such as will permit a separation of these parts, ordinary screw-threads being shown. 9 represents a mold which rests within a shoulder 10, formed at the top of the cylinder, and which mold carries on its bore the representation in negative or relief of a phonograph-record which it is desired to duplicate. This mold is preferably obtained by the process described in my application for Letters Patent filed March 5, 1898, Serial No. 672,650, by first depositing upon the original record a suitable metal in the form of an infinitesimally thin film by a process of vacuum de-

posit, by then electroplating or otherwise securing upon the film so obtained a sufficiently thick layer of the same or different metal, and by then properly backing up the metal so deposited or otherwise applied to the vacuum film either before or after the separation of the original record from the inclosing coating of metal either by contracting the record or by melting it out or in any other suitable way. The advantage of making a matrix or mold by first depositing upon an original phonograph-record a metal by a process of vacuum deposit is that an absolutely accurate copy in negative of such record will be produced, irrespective of the fineness thereof. The mold 9 is preferably made of sufficient mass or thickness as to effectively chill the molten material when the latter is introduced therein, as I shall explain. Carried by the upper part of the mold is an inclosing cap 11, which may be secured onto the mold and which forms a bearing for the plunger 7.

In making duplicate records with my improved apparatus I prefer to proceed substantially as follows: Molten material being placed within the tank or jar 1 is maintained in its liquid or fluid condition by the application of heat. The mold 9 being exposed to the atmospheric temperature is relatively cold. The plunger 7 is first depressed, so as to force the piston 4 downward within the cylinder, ejecting the liquid material from beneath it, which material passes out through the openings 6. The bore of the cylinder 3 may, as shown, be slightly enlarged below the openings 6, so as to permit the piston 4 to pass beneath the same. As soon as the piston 4 passes below the openings 6 the molten or fluid material enters the cylinder above the piston, so as to fill the cylinder to the level of the liquid in the tank or jar. Owing to the thin wall of the core 5 the latter will almost immediately reach the temperature of the molten material, so that said core will not chill the latter. If a solid core is used, it will require to be immersed within or below the surface of the liquid material for a longer time to enable its temperature to reach that of the molten mass; but with this exception the process will be equally operative with a solid core as with a hollow core.

Assuming the hollow core to be used and that its temperature reaches that of the molten material almost immediately, the plunger 7 will be elevated so as to carry the charge of molten material above the piston into the mold, as shown in Fig. 2, a greater or less excess of material passing above the mold into the cap 11. By employing the cap 11 it will be obvious that the level of the liquid material in the tank or jar may be varied considerably without affecting the operation. The liquid molten material entering the mold 9 will engage all portions of the record formed on the bore thereof, and the materially lower temperature of the mold will result in the

almost instantaneous chilling of the surface of the molten material therein. In order to facilitate this surface-chilling of the liquid molten material entering the mold, the latter may be actually cooled by artificial means below atmospheric temperature—as, for instance, by the circulation of cold water through a water-jacket surrounding the mold or by a blast of cold air equably directed to all portions of the mold. The chilling of the surface of the molten material in the mold results in the setting of the positive impression thus secured from the negative record. The chilling of the molten material in the mold progresses toward the center and any contraction in bulk will be compensated by the surplus material within the cap 11. As soon as the material within the mold has been chilled, throughout the entire thickness thereof, the material, with the piston, core, cap, and plunger, is removed from the cylinder, and the material is allowed to cool by exposure to a cold atmosphere or by an air-blast until the solidified material has contracted away from the bore of the mold, so as to permit it to be removed therefrom by forcing the plunger downward. The plunger is then removed from the core and the latter is extracted from the cast material, carrying the positive record on its periphery, before the material is contracted sufficiently upon the core as to prevent this separation. Since the conductivity of heat from the material is effected slowly, the outer surface of the molded duplicate becomes hard and set, while the inner portion thereof next to the core is still in a relatively plastic condition, so that this separation of the core can with ordinary care be readily effected. The resulting duplicates thus secured after reaching the normal temperature are properly dressed at the ends and are reamed internally to the proper size, being then ready for use. With records made in this way the contraction of the material radially to separate it from the mold is accompanied by a considerable longitudinal contraction following the instant when the surface is first set by the chilling effect of the mold and progressing until the material reaches the normal temperature. For this reason it is necessary that the original record from which the matrix is made be formed on a phonograph or allied talking-machine having a fewer number of threads on its feed-screw than the instrument on which the duplicates are finally used in order that when the contraction has progressed to its finality the pitch of the record-thread on the duplicate will correspond to the pitch of the feed-screw of the reproducing-machine, or approximately to that pitch, it being possible with modern reproducing apparatus to effect a satisfactory reproduction from a record, even when the pitch thereof differs slightly from that of the feed-screw of the machine. The pitch of the feed-screw of the machine on

which the original record is made will differ from the pitch of the feed-screw of the machine on which the resulting duplicates are to be used to an extent depending upon the coefficient of contraction of the material used and will be determined by experiment with the material employed. It will be of course understood that after the mold has been removed from the cylinder and the separation of the cast duplicate is being effected therefrom a new mold and its accompanying parts may be inserted in place upon the cylinder and the operations repeatedly carried on therewith.

15 Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is as follows:

1. An apparatus for duplicating phonograph-records, comprising in combination a mold carrying a record in negative on its bore, a core movable into and out of the mold, and means for causing a supply of molten material to enter the mold simultaneously with the introduction therein of the core, substantially as set forth.

2. An apparatus for duplicating phonograph-records, comprising in combination a mold carrying a record in negative on its bore, a cylinder supporting said mold and supplied with molten material, a core movable in said cylinder and mold, and a piston movable with the core for introducing a charge of molten material into the mold simultaneously with the introduction therein of said core, substantially as set forth.

3. An apparatus for duplicating phonograph-records, comprising in combination a mold carrying a record in negative on its bore, a cylinder supporting said mold and supplied with molten material, a hollow core movable in said cylinder and mold, and a piston movable with the core for introducing a charge of molten material into the mold simultaneously with the introduction therein of said core, substantially as set forth.

4. In an apparatus for duplicating phonograph-records, the combination of a mold carrying a record in negative on its bore, a cylinder removably supporting said mold and supplied with molten material, a core movable in said cylinder and mold, and means for introducing molten material into the mold simultaneously with the introduction of the core therein, substantially as set forth.

5. An apparatus for duplicating phonograph-records, comprising in combination a receptacle containing molten material, a cylinder in said receptacle, a mold carried by said cylinder, a core movable in the cylinder and mold, and a piston working in said cyl-

inder simultaneously with said core, substantially as set forth.

6. An apparatus for duplicating phonograph-records, comprising in combination a receptacle for containing a molten material, a cylinder in said receptacle, a mold removably carried by the cylinder and having a record in negative on its bore, a core movable in the cylinder and mold, a piston working in said cylinder and connected to the mold, and a plunger for operating said core, substantially as set forth.

7. An apparatus for duplicating phonograph-records, comprising in combination a receptacle for containing a molten material, a cylinder in said receptacle, a mold removably carried by the cylinder and having a record in negative on its bore, a core movable in the cylinder and mold, a piston working in said cylinder and connected to the mold, and a plunger removably connected with the core for operating the latter, substantially as set forth.

8. In an apparatus for duplicating phonograph-records, the combination of a receptacle or tank for containing the molten material, a cylinder therein, a mold movably carried by the cylinder and having a record in negative on its bore, a core working in the cylinder and mold, a piston connected to the core, and a cap secured over the upper side of the mold, substantially as set forth.

9. In an apparatus for duplicating phonograph-records, the combination of a receptacle or tank for containing the molten material, a cylinder therein, a mold movably carried by the cylinder and having a record in negative on its bore, a core working in the cylinder and mold, a piston connected to the core, and a cap removably secured over the upper end of the mold, substantially as set forth.

10. In an apparatus for duplicating phonograph-records, the combination of a receptacle or tank for containing the molten material, a cylinder therein, a mold movably carried by the cylinder and having a record in negative on its bore, a core working in the cylinder and mold, a piston connected to the core, a cap secured over the upper end of the mold, a bearing in said cap, and a plunger working in said bearing and connected to the core, substantially as set forth.

This specification signed and witnessed this 30th day of April, 1900.

THOS. A. EDISON.

Witnesses:

J. F. RANDOLPH,
FRANK L. DYER.

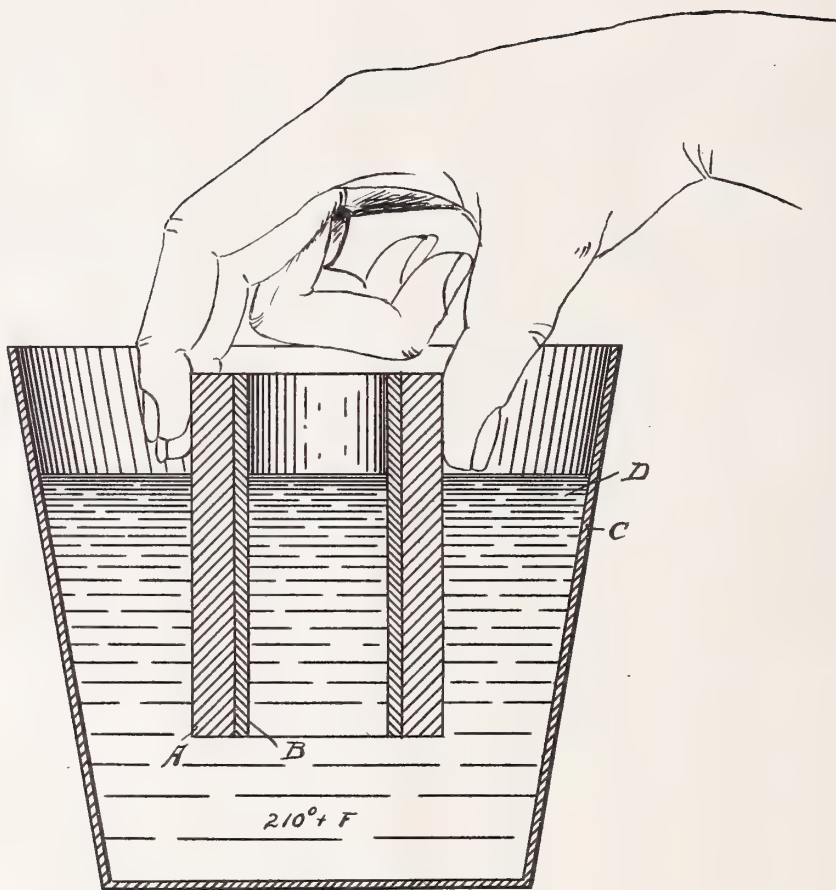
No. 667,600.

Patented Feb. 5, 1901.

G. H. STEVENS.
MOLDING CELLULOID.

(Application filed July 24, 1900.)

(No Model.)



WITNESSES
Chas. E. Wiener.
May E. Kott.

By

INVENTOR
George H. Stevens
Parker & Burton
Attorneys.

UNITED STATES PATENT OFFICE.

GEORGE H. STEVENS, OF TOLEDO, OHIO.

MOLDING CELLULOID.

SPECIFICATION forming part of Letters Patent No. 667,600, dated February 5, 1901.

Application filed July 24, 1900. Serial No. 24,639. (No model.)

To all whom it may concern:

Be it known that I, GEORGE H. STEVENS, a citizen of the United States, residing at Toledo, county of Lucas, State of Ohio, have
5 invented a certain new and useful Improvement in Molding Celluloid; and I declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to
10 make and use the same, reference being had to the accompanying drawing, which forms a part of this specification.

My invention relates to molding celluloid; and the object of my improvement is to provide a process by which celluloid cylinders
15 that have had phonographic records molded or pressed into their outer surfaces by a cylindrical matrix may be withdrawn from said matrix without danger of injuring the record
20 or the matrix.

In the art of reproducing phonographic records an electrotpe of a wax record is made. This is in a cylindrical form, with the negative of the record or the matrix upon its interior surface, and is reinforced by a strong
25 surrounding metallic cylinder. A celluloid cylinder of about the diameter of the interior of the matrix is now placed inside of the electrotpe and expanded until the record has
30 been impressed upon its outer surface. It is now desirable to withdraw the celluloid cylinder without injuring the delicate record upon it or upon the matrix. I have discovered that if the metal mold, with its inclosed
35 celluloid cylinder, be immersed in water at a temperature close to the boiling-point—say 210° Fahrenheit—the celluloid cylinder will contract in diameter without warping and that the surface will remain true and smooth,
40 one immersion being sufficient to contract a cylinder from one to one and one-fifth inches in diameter as much as one-eighth of an inch.

Referring to the accompanying drawing, A is the cylinder having the negative of the
45 record upon its inner surface.

B is the celluloid cylinder, which has had the indentations pressed into it from the projections on the interior of the matrix, as described, for instance, in United States Letters
50 Patent issued to me for improvements in proc-

esses of duplicating phonograms and numbered 650,431.

C is a pail or other receptacle for hot water, and D is the water therein, which should be at about boiling temperature.

I have shown the cylinders as being supported by the hand; but various other methods of supporting the cylinders in the water will occur to any one, and it may be desirable to entirely submerge the cylinders at
55 once. The effect may, however, be produced by placing a part of the cylinders in the water, as illustrated, holding them there a minute or less, and then turning them end for end and placing the other part of the cylinder
60 der into the water in the same way.

After removing the cylinders from the water it will be found that the celluloid cylinder is so much smaller than the cylinder A that it may be easily loosened and removed
70 therefrom.

Steam may be used instead of the hot water in fluid form.

The celluloid cylinders I have used are made by being drawn or pressed through a
75 die while in a plastic condition. They are then stretched to the required diameter by being forced over a cylindrical die while still in a plastic condition and allowed to cool and set. It is believed that this mode of manufacture may have an influence in adapting
80 them to contract on being reheated. However, a celluloid cylinder that has not been stretched or expanded in the direction of its diameter will also contract on being heated.
85 The immersion in the water should be for a short time in order that only the requisite amount of contraction may take place, as if the heating is continued too long the cylinder may warp in contracting.

Having fully described my invention, what I claim, and desire to secure by Letters Patent, is—

1. The process of loosening molded celluloid articles from molds consisting in causing
95 the article to contract by subjecting it to the action of hot water, substantially as described.

2. The process of loosening molded cylindrical celluloid phonograms from their molds, consisting in causing said phonograms to con-
100

tract in the direction of their diameters, by
subjecting the same to the action of hot water,
substantially as described.

3. The process of loosening molded cylin-
5 drical celluloid phonograms from their molds
consisting in causing said phonograms to con-
tract in the direction of their diameters, by
immersing both the mold and the phonogram
therein, in hot water, substantially as de-
10 scribed.

4. The process of loosening molded cellu-
loid articles from molds consisting in causing
the article to contract by subjecting it to the

action of a hot fluid, substantially as de-
scribed.

5. The process of loosening molded cellu-
loid articles from molds consisting in causing
the article to contract by heating it, substan-
tially as described.

In testimony whereof I sign this specifica- 20
tion in the presence of two witnesses.

GEORGE H. STEVENS.

Witnesses:

MINNIE KINGSLEY,
W. G. ULERY.



T. A. EDISON.
PROCESS OF DUPLICATING PHONOGRAPH RECORDS.

(Application filed May 8, 1900.)

(No Model.)

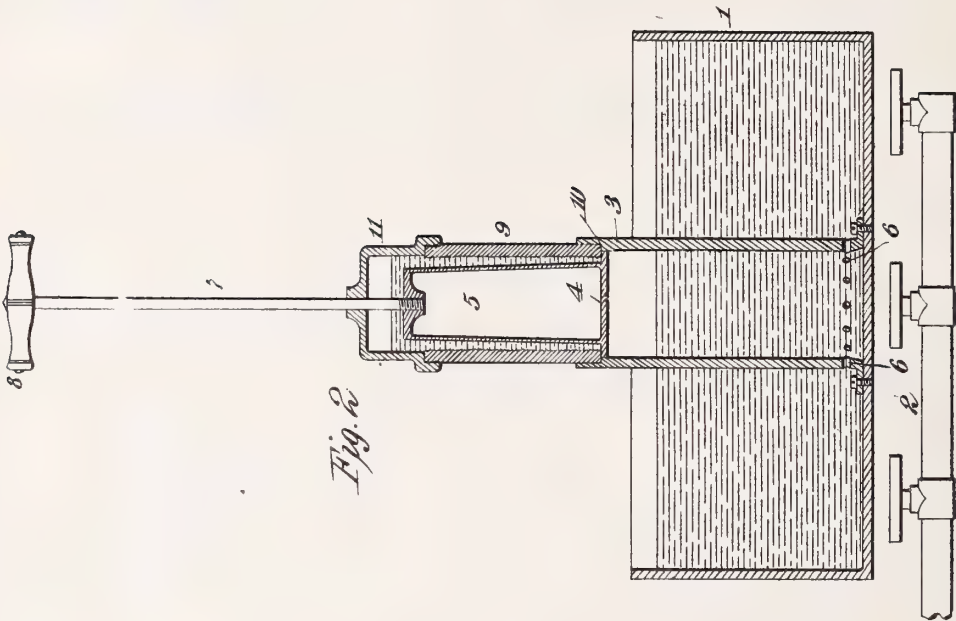


Fig. 2

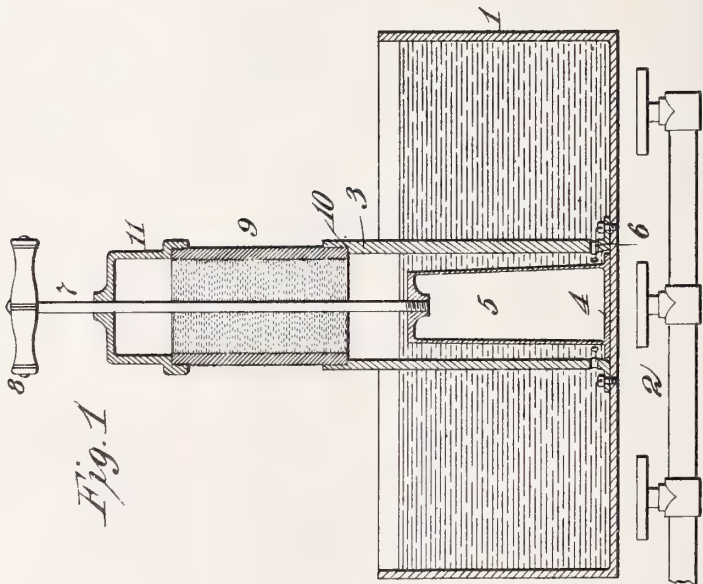


Fig. 1

Witnesses:

Geo. F. Coleman
Wm. R. Taylor

Inventor

Thomas A. Edison

By *Spencer Edmunds* *Att'ys.*

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

PROCESS OF DUPLICATING PHONOGRAPH-RECORDS.

SPECIFICATION forming part of Letters Patent No. 667,662, dated February 5, 1901.

Application filed May 8, 1900. Serial No. 15,874. (No specimens.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, a citizen of the United States, residing at Llewellyn Park, county of Essex, and State of New Jersey, have invented a certain new and useful Improved Process of Duplicating Phonograph-Records, (No. 1,036,) of which the following is a specification.

My invention relates to an improved process for duplicating phonograph-records, and the process is of the character covered by my Patent No. 484,582, of October 18, 1892, wherein a matrix of an original record is employed as a mold for the making of the duplicates. In the specific process described in my previous patent the matrix secured from the original record is divided longitudinally, so as to form a sectional mold in which are cast the desired duplicates. My present invention is designed specifically as an improvement on said process, and my object is to provide a process wherein the production of the duplicate records will be facilitated and wherein the character of the resulting duplicates will be improved, since the mold used is continuous on its bore.

My present process depends upon the fact that after a molten metallic soap or a mixture of soaps or other suitable material has been introduced within a mold carrying the representation of a phonographic record in relief on its bore and allowed to set a sufficient contraction of the resulting duplicate can be secured as to permit of a longitudinal separation of the duplicate from the mold, whereby a continuous mold can be employed for the carrying on of the process.

In order that my invention may be better understood, attention is directed to the accompanying drawings, forming a part of this specification, and in which—

Figure 1 is a sectional view of a suitable apparatus for the purpose, illustrating the plunger and piston in their lowermost position; and Fig. 2, a similar view showing the same parts in their elevated positions.

In both the above views corresponding parts are represented by the same numerals of reference.

The apparatus illustrated in the figures is designed for the duplicating of cylindrical phonographic records, and it will be so de-

scribed; but the applicability of my process for the duplication of other varieties of records will be apparent to those skilled in the art.

In the drawings, 1 represents a suitable jar or tank of the proper dimensions and made of any desired material. Within the jar or tank 1 I place the material of which the duplicate records are to be formed and which may be maintained in a molten condition by the application of heat in any way—as, for example, by a gas-tube 2, supplying a number of jets, as shown. The proper level of the molten material is indicated, and this level should be approximately maintained by the addition of fresh material from time to time within the tank as the liquid material may be withdrawn during the operation. The material in the tank 1 and of which the duplicate records are to be formed may be of any suitable character; but preferably it is a metallic soap or a combination of several soaps to which has been added a material not affected by water, such as ceresin, whereby the resulting duplicates will be protected from the effects of atmospheric moisture. Mounted within the tank and secured to its bottom is an open-ended cylinder 3, in which works a piston 4. A tapered core 5 is connected to or formed integrally with the piston 4, and said core is preferably hollow, so as to present a thin wall to the material, whereby the core will very quickly reach the temperature of the molten material when it is immersed therein. A number of openings 6 are formed in the cylinder 3, near the bottom thereof, below which openings the piston 4 passes in reaching its downward position, as shown in Fig. 1, whereby the liquid material may flow through said openings into the cylinder above the piston. Connected to the core 5 is a plunger 7, having an operating-handle 8. The connection between the core and plunger is such as will permit a separation of these parts, ordinary screw-threads being shown.

9 represents a mold which rests within a shoulder 10, formed at the top of the cylinder, and which mold carries on its bore the representation in negative or relief of a phonograph-record which it is desired to duplicate. This mold is preferably obtained by

the process described in my application for Letters Patent filed March 5, 1898, Serial No. 672,650, by first depositing upon the original record a suitable metal in the form of an infinitesimally-thin film by a process of vacuum deposit, by then electroplating or otherwise securing upon the film so obtained a sufficiently thick layer of the same or different metal, and by then properly backing up the metal so deposited or otherwise applied to the vacuum film either before or after the separation of the original record from the inclosing coating of metal either by contracting the record or by melting it out or in any other suitable way. The advantage of making a matrix or mold by first depositing upon an original phonograph-record a metal by a process of vacuum deposit is that an absolutely accurate copy in negative of such record will be produced irrespective of the fineness thereof. The mold 9 is preferably made of sufficient mass or thickness as to effectively chill the molten material when the latter is introduced therein, as I shall explain. Carried by the upper part of the mold is an inclosing cap 11, which may be secured onto the mold and which forms a bearing for the plunger 7.

In carrying out my improved process with an apparatus of this type I prefer to proceed substantially as follows: Molten material being placed within the tank or jar 1 is maintained in its liquid or fluid condition by the application of heat. The mold 9, being exposed to the atmospheric temperature, is relatively cold. The plunger 7 is first depressed, so as to force the piston 4 downward within the cylinder, ejecting the liquid material from beneath it, which material passes out through the openings 6. The bore of the cylinder 3 may, as shown, be slightly enlarged below the openings 6, so as to permit the piston 4 to pass beneath the same. As soon as the piston 4 passes below the openings 6 the molten or fluid material enters the cylinder above the piston, so as to fill the cylinder to the level of the liquid in the tank or jar. Owing to the thin wall of the core 5 the latter will almost immediately reach the temperature of the molten material, so that said core will not chill the latter. If a solid core is used, it will require to be immersed within or below the surface of the liquid material for a longer time to enable its temperature to reach that of the molten mass; but with this exception the process will be equally operative with a solid core as with a hollow core.

Assuming the hollow core to be used and that its temperature reaches that of the molten material almost immediately, the plunger 7 will be elevated, so as to carry the charge of molten material above the piston into the mold, as shown in Fig. 2, a greater or less excess of material passing above the mold into the cap 11. By employing the cap 11 it will be obvious that the level of the liquid material in the tank or jar may be varied consid-

erably without affecting the operation. The liquid molten material entering the mold 9 will engage all portions of the record formed on the bore thereof, and the materially lower temperature of the mold will result in the almost instantaneous chilling of the surface of the molten material therein. In order to facilitate this surface-chilling of the liquid molten material entering the mold, the latter may be actually cooled by artificial means below atmospheric temperature—as, for instance, by the circulation of cold water through a water-jacket surrounding the mold or by a blast of cold air equably directed to all portions of the mold. The chilling of the surface of the molten material in the mold results in the setting of the positive impression thus secured from the negative record. The chilling of the molten material in the mold progresses toward the center, and any contraction in bulk will be compensated by the surplus material within the cap 11. As soon as the material within the mold has been chilled throughout the entire thickness thereof the material with the piston, core, cap, and plunger are removed from the cylinder, and the material is allowed to cool by exposure to a cold atmosphere or by an air-blast until the solidified material has contracted away from the bore of the mold, so as to permit it to be removed therefrom by forcing the plunger downward. The plunger is then removed from the core, and the latter is extracted from the cast duplicate, carrying the positive record on its periphery before the material has contracted sufficiently upon the core as to prevent this separation. Since the conductivity of heat from the material is effected slowly, the outer surface of the molded duplicate becomes hard and set, while the inner portion thereof next to the core is still in a relatively plastic condition, so that this separation of the core can with ordinary care be readily effected. The resulting duplicates thus secured after reaching the normal temperature are properly dressed at the ends and are reamed internally to the proper size, being then ready for use.

With records made by my process the contraction of the material radially to separate it from the mold is accompanied by a considerable longitudinal contraction following the instant when the surface is first set by the chilling effect of the mold and progressing until the material reaches the normal temperature, such shrinkage being approximately one per cent. with ordinary blanks. For this reason it is desirable that the original record from which the matrix is made is formed on a phonograph or allied talking-machine having a fewer number of threads on its feed-screw than the instrument on which the duplicates are finally used, in order that when the contraction has progressed to its finality the pitch of the record-thread on the duplicate will correspond to the pitch of the feed-screw of the reproducing-machine or approximately to that pitch, it being possible

with modern reproducing apparatus to effect a satisfactory reproduction from a record, even when the pitch thereof differs slightly from that of the feed-screw of the machine.

5 The pitch of the feed-screw of the machine on which the original record is made will differ from the pitch of the feed-screw of the machine on which the resulting duplicates are to be used to an extent depending upon the
10 coefficient of contraction of the material used and will be determined by experiment with the material employed. It will be of course understood that after the mold has been removed from the cylinder and the separation
15 of the cast duplicate is being effected therefrom a new mold and its accompanying parts may be inserted in place upon the cylinder, and the operations repeatedly carried on therewith.

20 Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is as follows:

1. The process of duplicating cylindrical phonographic records, which consists in first
25 making an original record with a spiral record-groove of greater pitch than that desired on the duplicate to be produced, then in making a hollow cylindrical matrix or mold from said original record, carrying the record in negative on its bore, and in finally making duplicate
30 records from the matrix or mold by introducing therein and engaging therewith material maintained in an abnormally high temperature, whereby the cooling of such duplicate will contract the pitch of the record-groove, as and for the purposes set forth.

2. The process of duplicating phonographic records, which consists in securing a mold
40 containing the record in negative on its bore, in introducing a molten material in the mold to receive a surface impression from such record, in allowing the molten material to set, in contracting the set material, and in separating the contracted molded material
45 by a longitudinal movement, substantially as set forth.

3. The process of duplicating phonographic records, which consists in securing a mold
50 having a record in relief in negative on its bore, in introducing a molten material in the mold around a core, in allowing the molten material to set, in contracting the set material, in removing the contracted material and the core from the mold, and in separating
55 the core from the molded material, substantially as set forth.

4. The process of duplicating cylindrical phonograph-records, which consists in forming
60 a cylindrical mold with a record in negative on its bore, in introducing a molten material in the mold to form a cylindrical duplicate, in allowing the duplicate to set, in contracting the duplicate, and in removing the contracted duplicate by a direct longitudinal movement, substantially as set forth.

5. The process of duplicating cylindrical phonograph-records, which consists in forming a cylindrical mold having the record in negative on its bore, in introducing molten
70 material in the mold around a core, whereby a hollow cylindrical duplicate will be formed, in allowing the molten material to set, in contracting the molten material, and in withdrawing the contracted material from the mold by a direct longitudinal movement, substantially as set forth.

6. The process of duplicating cylindrical phonograph-records, which consists in forming a cylindrical mold carrying the record in negative on its bore, in introducing a molten
80 material in the mold around a core, in allowing the material to set, in contracting the material, in withdrawing the contracted material and core from the mold, and in separating the core from the resulting duplicate, substantially as set forth.

7. The process of duplicating cylindrical phonograph-records, which consists in making a cylindrical mold carrying a record in negative on its bore, and of sufficient mass
90 to produce a chilling effect on molten material introduced therein, then in introducing within the mold a molten material, the surface of which becomes chilled by contact with the mold, then in contracting the duplicate
95 so formed, and finally, separating the duplicate from the mold by a direct longitudinal movement, substantially as set forth.

8. The process of duplicating cylindrical phonograph-records, which consists in securing
100 a mold carrying a record in negative on its bore, and of sufficient mass to produce a chilling effect on molten material introduced therein, then in introducing within the mold around a core a molten material, the surface
105 of which is chilled by contact with the mold, then in contracting the material, then in removing the contracted material and core from the mold, and in finally separating the core from the material, substantially as set
110 forth.

9. The process of duplicating cylindrical phonograph-records, which consists in maintaining in a molten condition a mass of material from which the duplicates are to be made,
115 in sustaining a mold over the mass of molten material, said mold carrying on its bore a record in negative, in successively elevating a part of the mass of molten material into the mold, in allowing such molten material
120 within the mold to set, in contracting the set material, and in withdrawing the resulting duplicate from the mold by a direct longitudinal movement, substantially as set forth.

This specification signed and witnessed
125 this 30th day of April, 1900.

THOS. A. EDISON.

Witnesses:

J. F. RANDOLPH,
FRANK L. DYER.

Not Classified Under Acoustics.

No. 667,728.

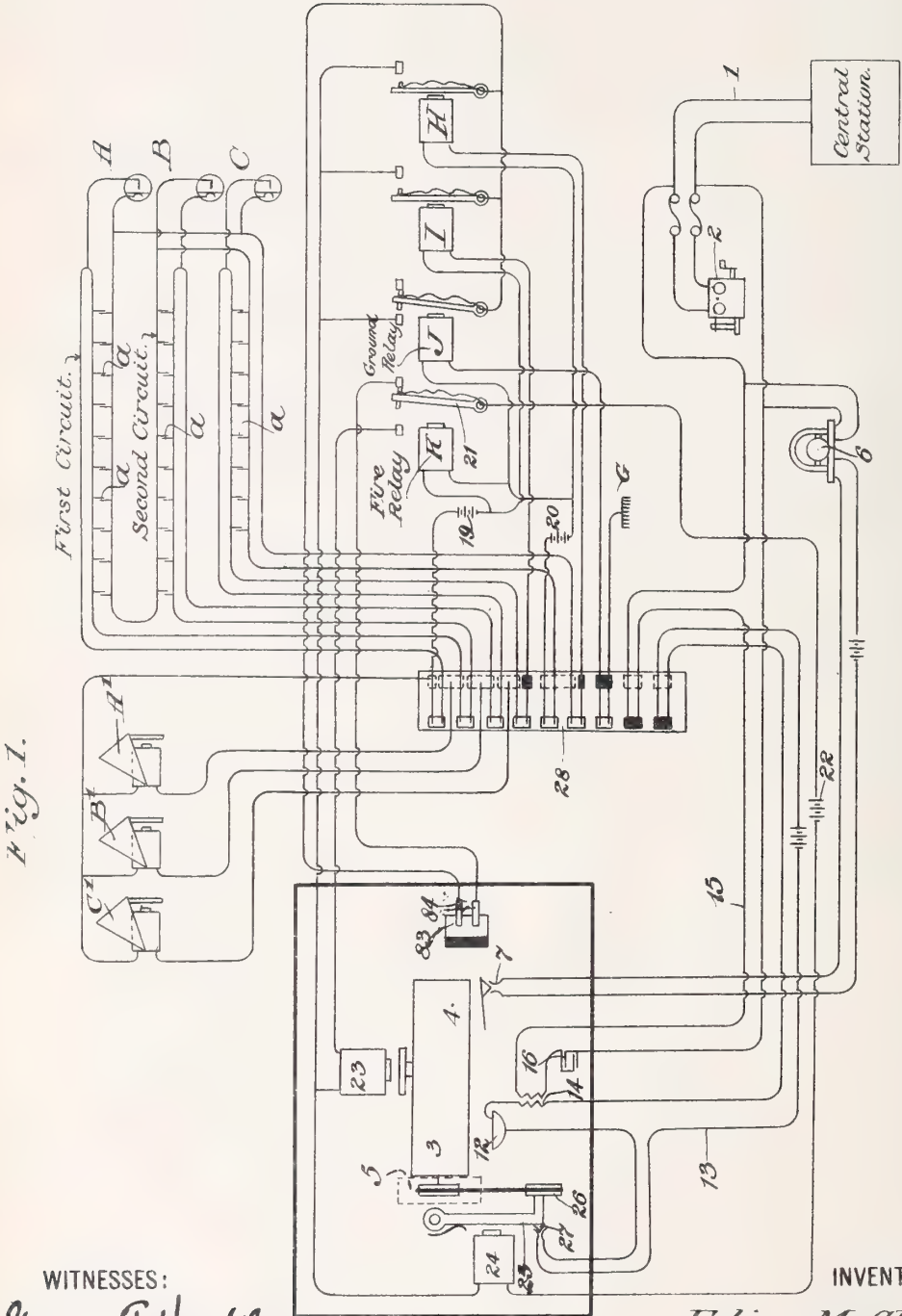
Patented Feb. 12, 1901.

F. MCGLOIN.
TALKING MACHINE.

(Application filed June 6, 1900.)

(No Model.)

6 Sheets—Sheet 1.



WITNESSES:

George T. Hackley
E. R. Howell

INVENTOR

Felix McGloin.

BY

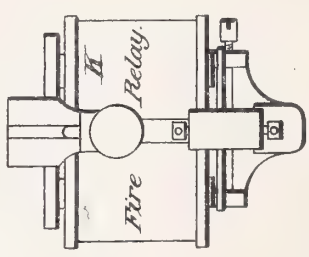
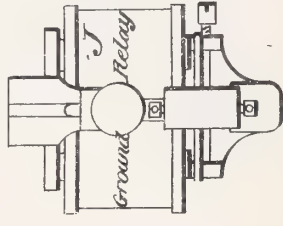
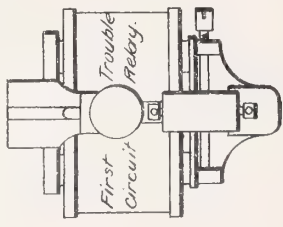
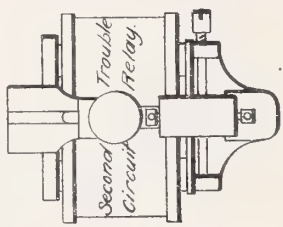
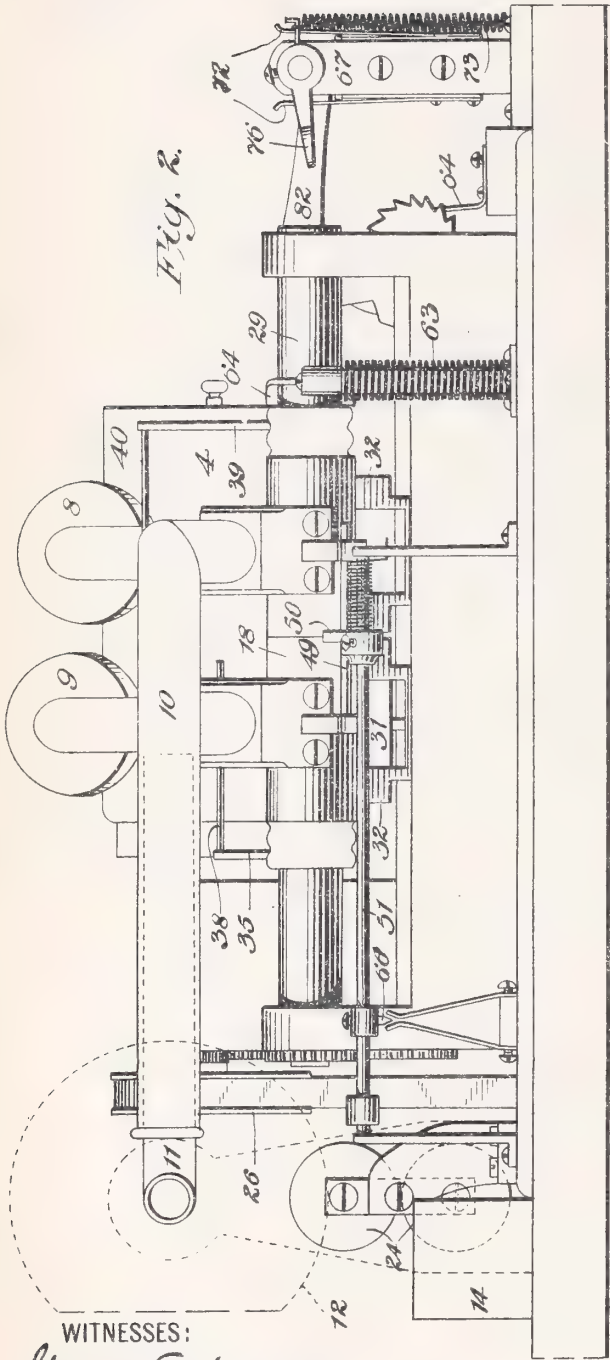
R. C. McNeel
ATTORNEY

F. MCGLOIN.
TALKING MACHINE.

(Application filed June 6, 1900.)

(No Model.)

6 Sheets—Sheet 2.



INVENTOR

Felix McGloin.

BY

Reinhardt
ATTORNEY

WITNESSES:

George T. Hackler
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No. 667,728.

Patented Feb. 12, 1901.

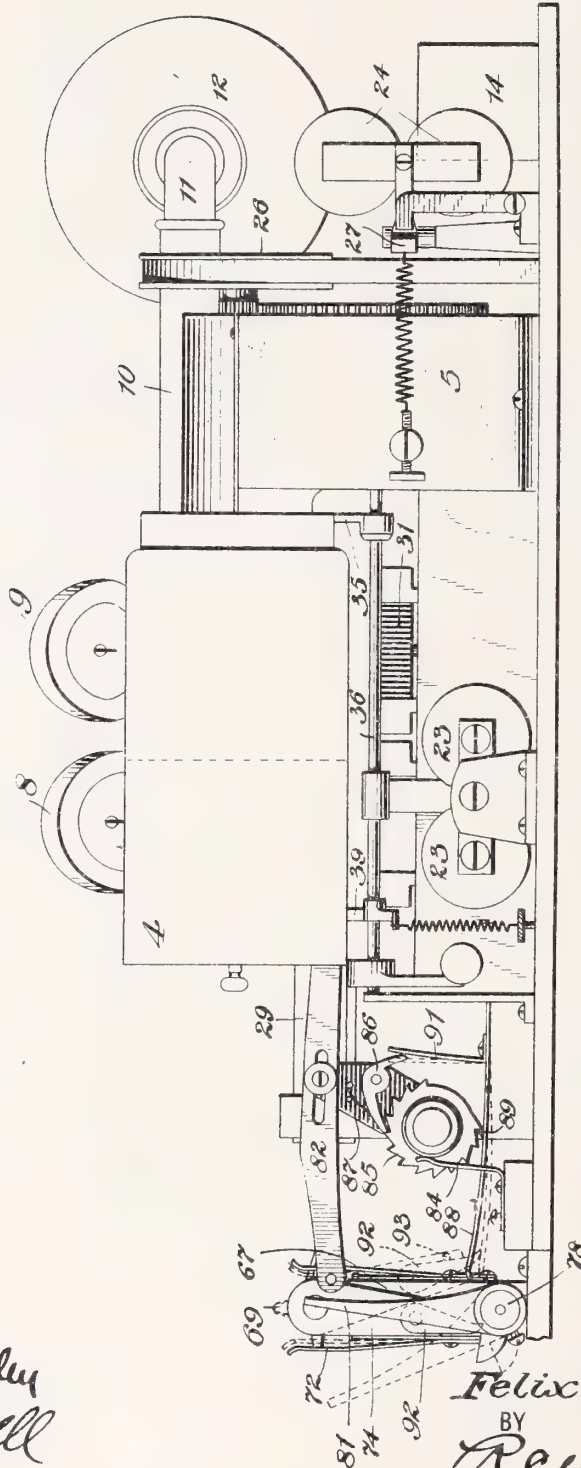
F. MCGLOIN.
TALKING MACHINE.

(Application filed June 6, 1900.)

(No Model.)

6 Sheets—Sheet 3.

Fig. 3.



WITNESSES:

George T. Hackley
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No. 667,728.

Patented Feb. 12; 1901.

F. MCGLOIN.
TALKING MACHINE.

(Application filed June 6, 1900.)

(No Model.)

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Fig. 4.

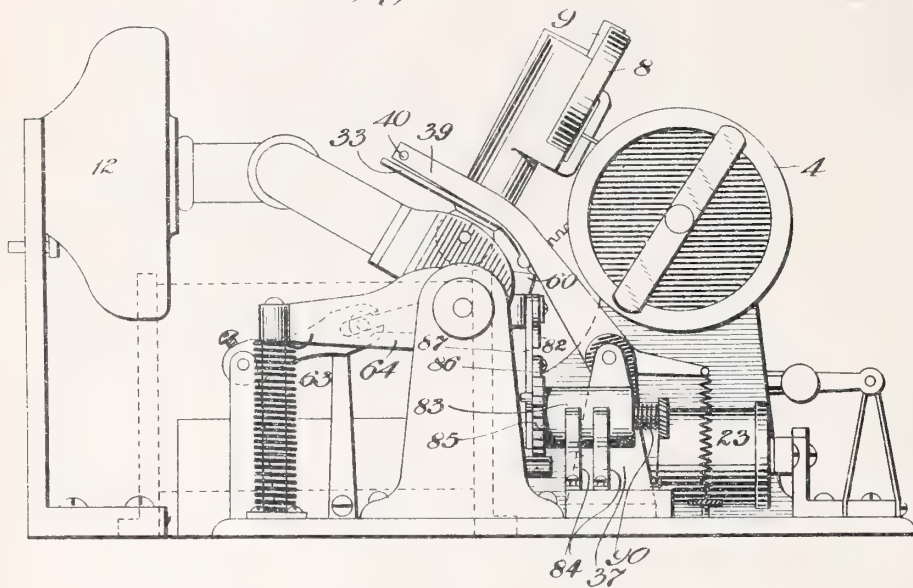
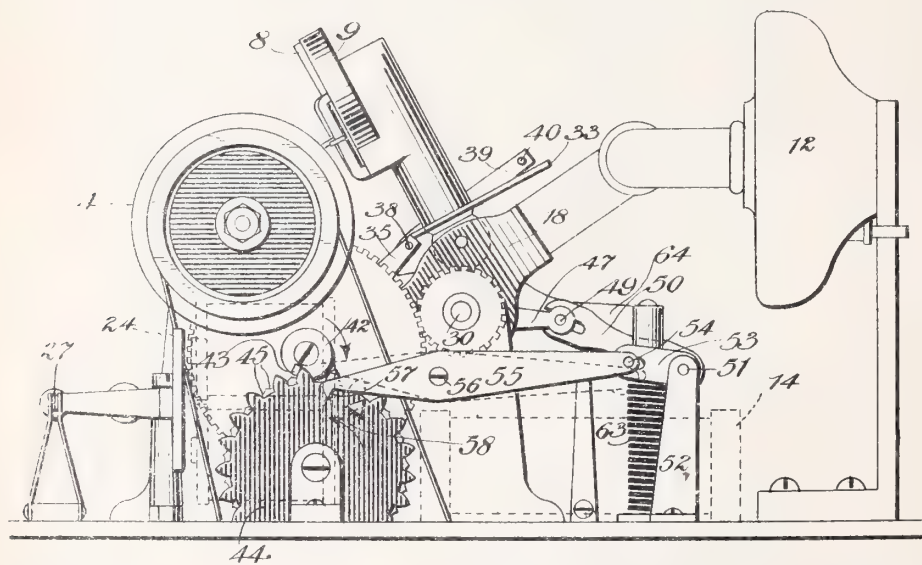


Fig. 5.



WITNESSES:

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E. R. Newell

INVENTOR

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F. MCGLOIN.
TALKING MACHINE.

(Application filed June 6, 1900.)

(No Model.)

6 Sheets—Sheet 5.

Fig. 6.

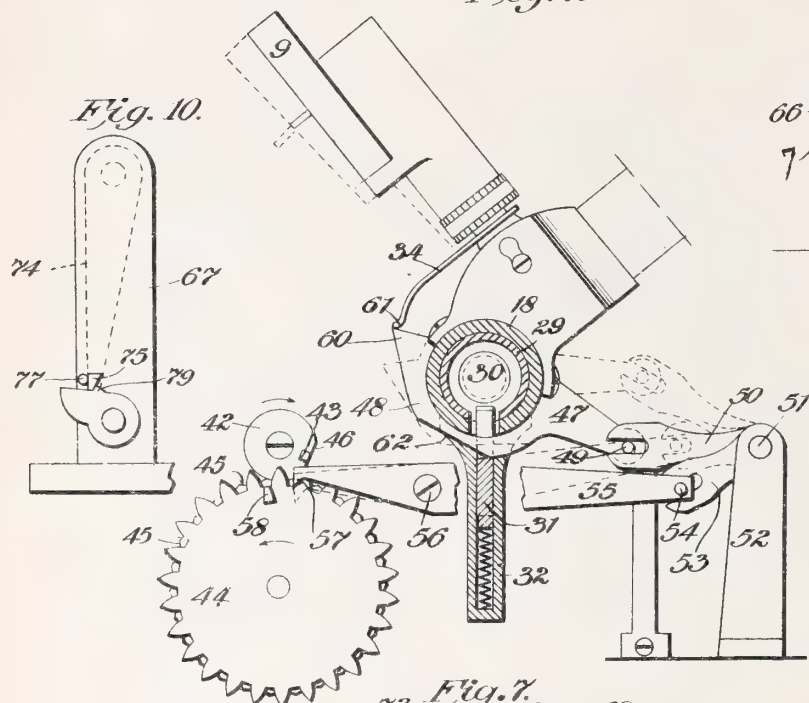


Fig. 6a.

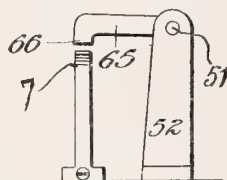


Fig. 10.

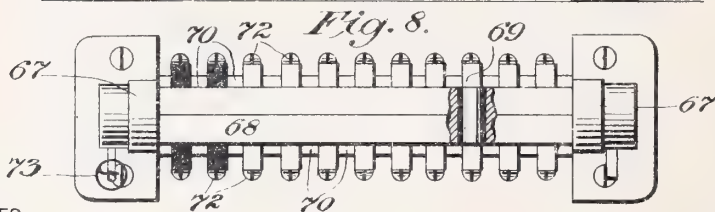
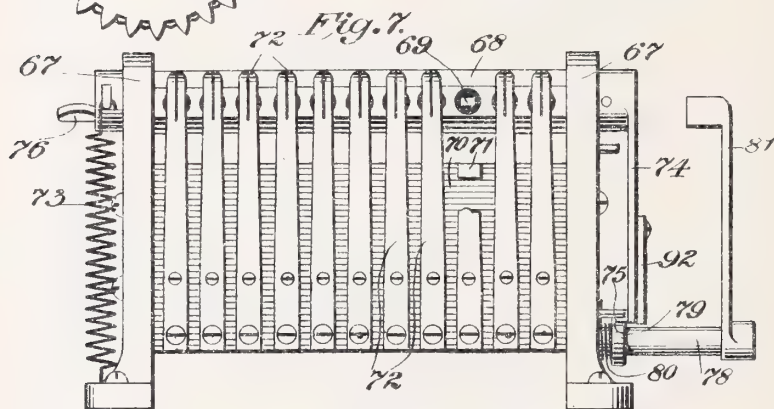
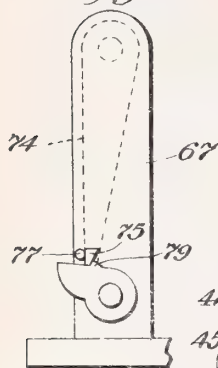


Fig. 9.



WITNESSES:

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INVENTOR

Felix McGloin.

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No. 667,728.

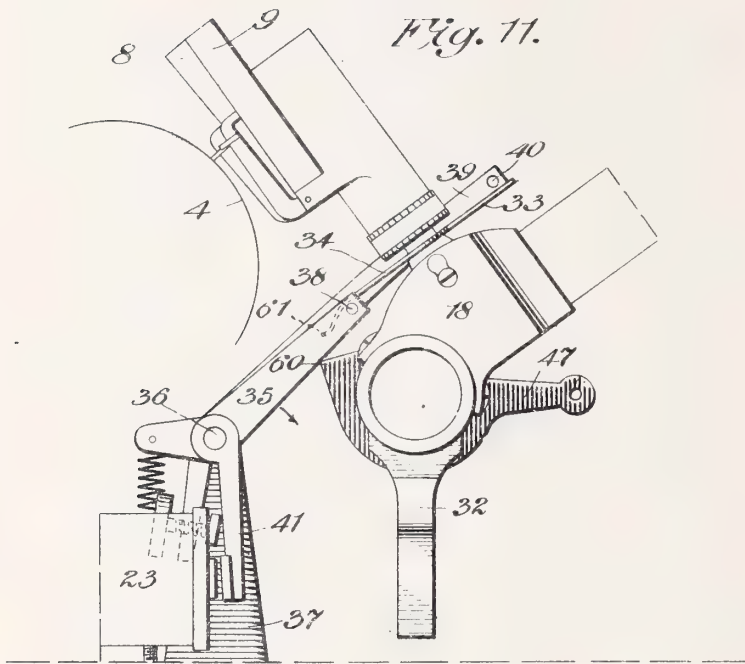
Patented Feb. 12, 1901.

F. MCGLOIN.
TALKING MACHINE.

(Application filed June 6, 1900.)

(No Model.)

6 Sheets—Sheet 6.



WITNESSES:

George J. Hackley
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UNITED STATES PATENT OFFICE.

FELIX MCGLOIN, OF NEW YORK, N. Y., ASSIGNOR TO THE AUTOMATIC FIRE ALARM COMPANY, OF SAME PLACE.

TALKING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 667,728, dated February 12, 1901.

Application filed June 6, 1900. Serial No. 19,203. (No model.)

To all whom it may concern:

Be it known that I, FELIX MCGLOIN, a citizen of the United States; residing at New York city, county and State of New York, have invented certain new and useful Improvements in Talking-Machines, of which the following is a full, clear, and exact description.

My invention relates to talking-machines and attachments therefor which are particularly useful in an improved automatic-alarm system; and one of my objects is to provide a system which by the variation in the electrical condition of an electric circuit will automatically send in an alarm. This is particularly useful in a fire-alarm system; but it will be obvious that it may be applied to send in a burglar or other alarm. I prefer to employ the system in connection with the common telephone-circuit in general commercial use at the present day, and in such case I provide a talking-machine so arranged as to send in an alarm-message over the telephone-circuit, such as "There is a fire at 41 Park Row. Please notify the fire department," an electric protective circuit, and means to automatically send a signal over said telephone-circuit when a certain variation in the electrical condition of said protective circuit, such as a closing of the circuit, takes place. This will call attention to the fact that an alarm-message is to be sent. The signal is then interrupted and the talking-machine sends the alarm-message over the telephone-circuit. All this takes place automatically on said variation in the electric protective circuit. I prefer to provide the talking-machine with a plurality of records to indicate the different causes of different variations in the protective circuit, and I have provided in this embodiment electric circuits, preferably independent and forming parts of the protective circuit, which will also send a signal in case of trouble on the wires, such as a break or a ground, and automatically select the proper record to indicate this trouble and cause the talking-machine to send a "trouble-message," such as "There is trouble on the wires at 41 Park Row," over the telephone-circuit. I have also provided a construction by which the record is passed over by the reproducer a plurality of times before the alarm-message is

interrupted, so that the signal and message are repeated over the telephone-circuit, thus insuring their being received.

Some of the features shown and described in the following specification are broadly claimed in my former application, Serial No. 17,340, filed the 21st day of May, 1900.

In this present application I have claimed more particularly the construction; and my object is to claim, among other things, the automatically-operating switches.

In the preferred embodiment shown in the drawings, Figure 1 is a diagrammatic view showing my system. Fig. 2 is a front elevation of the talking-machine—in this case a phonograph—and some of the switches, showing also some of the relay-magnets. Fig. 3 is a rear view of the device shown in Fig. 2. Fig. 4 is an end elevation of the device shown in Fig. 3 looking from left to right of said figure, the automatic switch at the left of Fig. 3 having been removed. Fig. 5 is an end elevation of the device shown in Fig. 3 looking from right to left. Fig. 6 is a detail, partly in section, of the device shown in Fig. 5. Fig. 6^a is a detail. Fig. 7 is a rear elevation of the automatic switch shown at the left of Fig. 3. Fig. 8 is a plan view of the device shown in Fig. 7. Fig. 9 is a detail of the switch shown in Fig. 7. Fig. 10 is a detail of the catch mechanism at the right end of Fig. 7, and Fig. 11 is a detail showing the magnet and connections for selecting the proper reproducer.

In the above diagram of the preferred embodiment of my invention, (shown in Fig. 1,) 1 represents an electric circuit provided with means to communicate intelligence at a distance, preferably, as has been stated heretofore, a telephone-circuit, such as is in common commercial use at present day. This circuit is provided with a subscriber's transmitting and receiving instrument 2, and the circuit passes through a central or receiving station. 3 is a machine to send a message over the circuit 1—in this case a talking-machine—such as a phonograph having a cylindrical record 4, actuated by any suitable means, such as by a spring in a box 5, through suitable gear connections. 6 is a device, such as an interrupter, for transmitting a signal

over the telephone-circuit, such as ringing the bells of the subscriber's instrument and also causing a signal-annunciator to be operated in the central station. The circuit in this interrupter is normally open, as shown at 7, and the secondary of the interrupter is connected in the present case in parallel with the subscriber's instrument. The record-cylinder 4 is preferably provided with a plurality of records—such as a "trouble-record" to indicate that there is some trouble with the wires, such as a ground or a break, and also with a "fire" or other record to indicate a fire or other cause—and each of these records is preferably provided with a reproducer. These reproducers 8 and 9 are preferably both carried on the carriage 18, Fig. 6, and are provided with a sound-carrying tube 10, which telescopes with a stationary sound-tube 11, connected with the telephone-transmitter 12 in an electric circuit 13. This circuit through the transmitter 12 is preferably normally open, as shown, and may be connected with the telephone-circuit, preferably in parallel with the subscriber's instrument. In the present case the circuit 13 is not connected mechanically with the telephone-circuit, but electrically through the secondary of the induction-coil 14 in the circuit 15, which is in parallel with the subscriber's instrument. 16 is a condenser.

Referring now to Fig. 1, I have provided what I have called an "electric protective circuit" and devices, preferably electrically actuated, which when the electrical condition of this electric protective circuit is varied or changed, such as by closing the open protective circuit or by a ground or break, will send in a cautionary signal over the telephone-circuit and then interrupt the same and send in a message over said circuit to indicate the cause of the trouble, such as fire or trouble on the wires. In the present embodiment this electric protective circuit is normally open and is closed by a connection between two normally independent circuits. These normally independent circuits in the present embodiment are indicated by "first circuit" and "second circuit." These independent circuits, as will be seen from an inspection of the diagram, are normally closed through relay-magnets I and H, which magnets are therefore normally energized to keep their armatures in the position shown.

A, B, and C represent different floors of a building to be protected or different buildings, and *a a* thermostats, which when heated will vary the electrical condition of the first circuit by in this case closing the same by making connection between the two independent circuits.

J and K are two normally inactive relay-magnets, the winding of the magnet K being connected across the first circuit and second circuit, as shown; but the circuit through said magnet will not therefore be completed, as there is no return-path for a current passing between said circuits. When, however,

a fire occurs and one of the thermostats *a* is heated, the same makes a connection between the two independent circuits and completes the circuits through magnet K. The protective circuit, which is then closed, will start, for instance, from battery 19 and go through the first circuit until it reaches the thermostat *a*, which has been actuated, through said thermostat to the second circuit, to and through battery 20, and from thence through the wiring of magnet K. The energizing of this magnet will draw its armature 21 to the left and close the circuit from battery 22 through magnets 23 and 24.

25 is a lever forming an armature for magnet 24 and engaging the wheel 26 to form a brake to prevent the operation of the talking-machine, and when this circuit through magnet 24 is closed the armature 25 will be drawn to the left and allow the talking-machine to operate.

27 is a contact-piece carried by this armature 25, which closes the circuit 13 from the transmitter as far as the automatically-operated switch 28. This switch 28 is automatically thrown from one position to another, shown by the two lines of contact-points, the unshaded blocks being conducting portions and the shaded blocks being non-conductors.

Referring now to the other figures of the drawings, 29 is a shaft forming a track along which the carriage 18 travels. Attached to this carriage—in the present embodiment pivoted thereto—so as to be independently movable to and from their operative position in relation to the record 4, are reproducers 8 and 9. 30 is a threaded shaft rotated by the motor and engaged by a movable spring-pressed threaded block 31, carried in a casing 32 on the carriage. When the threads on this block 31 engage the threads of the shaft 30, the carriage, and therefore the reproducers, will be carried along the record-cylinder, which will be suitably rotated as usual in this class of machines. The reproducer 8 is normally in its operative position in contact with the record-cylinder, and preferably in contact with the trouble record, while the reproducer 9 is normally out of contact with its record.

When a fire occurs, it is desirable to transmit the "fire-message" and not the trouble-message, and I therefore have provided a means for selecting the proper record, so as to send the proper message when a fire occurs. As before explained, when one of the thermostats is actuated to close the protective circuit the magnet 23, as well as the magnet 24, will be actuated.

Referring now to Fig. 11, 33 is a projection in the form of an arm from the "trouble-reproducer" 8, and 34 is a similar arm projecting from reproducer 9. These arms in the present embodiment project in opposite directions. 35 is a lever fixed to shaft 36, which shaft is pivoted in the stationary frame 37 of the instrument. This lever 35 carries a laterally-extending pin 38, (see Fig. 2,) over

which the arm 34 slides as the carriage moves in one direction or the other. 39 is a lever similar to 35 and having a pin 40, which pin extends in an opposite direction from pin 38. 41 is a short arm, also attached to shaft 36 and forming the armature of magnet 23. As pins 38 and 40 stand on opposite sides of the arms 33 and 34, when the magnet 23 is actuated and the arms 35 and 39 therefore drawn down the reproducer 8 will be raised out of contact with the record-cylinder and the reproducer 9 will be dropped into contact therewith. As the reproducer 9 is the one for producing the fire-message, this closing of the protective circuit will therefore cause the apparatus to select the "fire-record" and also start the talking-machine.

Referring now to Figs. 2, 5, and 6, 42 is a wheel rotated by the motor and carrying lug 43. 44 is a toothed wheel having curved depressions 45, which fit the circumference of wheel 42. As the lug 43 on wheel 42 strikes a tooth on wheel 44 a cut-away portion 46 of the wheel 42 releases the wheel 44 and allows the same to be rotated one tooth. The wheel 44 is intended to rotate a little less than once at each traverse of the carriage from left to right in Fig. 2. 47 is an arm attached to a sleeve 48, pivoted on and carried by the carriage 18. This arm 47 is provided with a rod 49, which slides between the jaws of an arm 50, attached to a shaft 51, pivotally mounted in bearings 52 on the frame. 53 is a second arm, also attached to rod 51 and engaging pin 54 on the end of a lever 55, pivoted at 56. The left end of this lever 55 has a foot 57, which is engaged by a lug 58 on the wheel 44. The parts shown in Fig. 6 are normally in the position indicated by dotted lines in Fig. 6 and in full lines in Fig. 5. The wheel 44 is intended to make nearly one complete revolution in one traverse of the carriage from left to right in Fig. 2. When, therefore, the wheel 44 has made nearly one complete revolution, the lug 58 will strike foot 57 and throw the parts into the position shown in full lines and the nose 60 on sleeve 48 will strike a curved projection 61 on arm 34, attached to reproducer 9, and will not only raise the reproducer 9, but will throw both reproducers up from the position shown in Fig. 11, thus raising both reproducers away from their operative position with relation to the record-cylinder. At the same time a cam formed by a cut-away portion 62 of sleeve 48 forces down the plunger 31 out of engagement with the threaded shaft 30. The carriage is thus released from the shaft 30, and a spring 63 and pivoted arm 64, Figs. 2 and 4, then throw the carriage back to the starting position at the left. When the carriage is at the end of its traverse to the right, as shown in Fig. 2, and the parts are in the position shown in full lines, a rod 65, also attached to rod 51, Figs. 2 and 6, which arm carries a contact-piece 66, is thrown upward, and the contact-piece 66 engages with the contact-points at 7 and closes the

circuit through the interrupter 6, thus sending the cautionary signal over the telephone-circuit.

Referring now to Figs. 1, 3, and 7, the switch 28 (shown in diagram in Fig. 1 and in elevation in Fig. 7) is at the left in Fig. 3. This switch is automatically thrown by the movement of the carriage in its first traverse, and said switch makes different connections with the circuits. 67 67 are standards attached to the frame of the machine, and pivoted in them is a rotating or rocking bar 68, carrying contact-blocks 69, which are insulated from the bar and from each other, as shown in Fig. 8. 70 is a non-conducting portion of the switch having contact-strips running through the same, as shown in Fig. 9, and bent over on each side, as seen at 71. 72 indicates contact-strips which spring toward and make contact with the contact-points 71; but when the contact-carrier 68 is rotated, so that the contact-blocks 69 engage the strips 72, these strips are pushed away from contact with the portions 71. The normal position of the switch is shown in Figs. 7 and 8, with the contact-blocks 69 making the connections shown in the left-hand line of contacts in the switch 28 in Fig. 1. 73 is a spring tending to throw the contact-carrier 68 into a position in which the contact-blocks 69 will be vertical, as shown in dotted lines in Fig. 3.

To retain the parts in the position shown in Fig. 7, I have provided a catch device which may be automatically released by the movement of the reproducer-carriage. 74 is an arm attached to the contact-carrier 68 and having a lug 75 at its lower end. 76 is a finger-lever extending from contact-carrier 68, by which the contact-carrier may be thrown into the position shown in Fig. 7. 77 is a pin to limit the motion of the arm 74. 78 is a rotatable shaft carrying a stop 79, which arm is by a spring 80 normally thrown into the position shown in Fig. 10. Stop 79 has an inclined front face, so that when the arm 74 is pushed downward the lug 75 will engage this inclined face and slightly rotate the arm 78 against the action of spring 80 until lug 75 passes into the position shown in Fig. 10, when the stop 79 will spring up and engage the same, thus securely holding the parts in the position shown in Fig. 7. 81 is a finger-lever for manually releasing the parts, if desired. The contact-strips 71 make the connections shown in the line of contacts at the right of switch 28 in Fig. 1.

Referring now to Fig. 3, as the carriage moves to the left in that figure (to the right in Fig. 2) a projection 82 from the carriage will be moved to the left and will strike arm 81. This will occur just before the plunger 31 is disengaged from the shaft 30. The movement of the arm 81 to the left in Fig. 3 by the projection 82 will therefore release the lug 75 on arm 74 and the spring 73 will suddenly rotate the contact-carrier 68 into the position shown in dotted lines in Fig. 3 and allow the

contact-strips 72 to engage with the contact-pieces 71, thus changing the connections of the circuits and closing the circuits 13 and 15, and thus automatically connecting the telephone-transmitter 12 with the telephone-circuit. The contact-point 66 will be in engagement with the contact portion 7, thus sending in the cautionary signal over the telephone-circuit until the lug 43 on wheel 42 comes into contact with the left end of lever 55, throwing the parts back into the position shown in dotted lines in Fig. 6 and in full lines in Fig. 5 and breaking the interrupter-circuit at 7. The cautionary signal will therefore be sent in only for the time during which the wheel 42 makes one revolution. The spring 63 and arm 64 have now thrown the carriage to the left in Fig. 2 and to the right in Fig. 3, and the lug 42 has returned the parts to their original position, dropping one of the reproducers into contact with the record. The reproducer will then travel over the record, and as the circuit from the transmitter 12 through the telephone-circuit is closed the talking-machine will then, as the carriage travels to the left in Fig. 3, send the message over the telephone-circuit. I prefer to have the message repeated several times, and to this end the reproducer travels over the record a plurality of times. To prevent the repetition of the alarm more than a given number of times, I have provided a device in the form of a switch, which will automatically stop the machine after one alarm has been transmitted a certain number of times. It is not so important that the "trouble-alarm" should be immediately attended to as the "fire-alarm." Therefore I have provided a device which will repeat the fire-message until the device is reset, but will only repeat the trouble-message a few times—say three or four times. To accomplish this, I have provided a switch 83, Fig. 1, which in this embodiment (Fig. 3) is in the form of a rotatable shaft having an insulated portion, shown in black in Fig. 1, and a conducting portion, shown in white. This conducting portion makes electrical connection between the contact-points 84. 85 is a ratchet attached to this shaft and engaged by a pawl 86, normally pressed into contact with said ratchet by a spring, as shown in Fig. 3. This pawl 86 is carried on a rocking lever 87, from which a pin extends through a slot in the arm 82. The ratchet is therefore moved to the left in Fig. 3 at each traverse of the carriage and rotates the ratchet, and therefore the switch, a certain distance. The conducting portion of the switch-shaft may be just broad enough, so that after the trouble-message has been repeated three or four times the insulated portion will come under the contact-points 84 and break the circuit. 88 is a spring carrying a detent 89 for engagement with the teeth on the ratchet to hold the same in opposition to the force of spring 90, Fig. 4, which spring tends to rotate said switch-shaft from left to right in Fig. 3 back to the normal position. (Shown in Figs. 1 and 3.) This spring 88 also carries a spring-arm 91, which engages with the heel of the pawl to throw the same out of engagement with the ratchet.

In order to set both switches in normal position, I have provided a connection between the two switches, whereby by the movement of one switch to its normal position both switches are automatically set. In this embodiment I have provided a swinging finger 92, carried by lever 74. This swinging finger is free to be moved to be left in Fig. 3, but is stopped from movement to the right by the pin 93 on lever 74. This finger 92 is long enough to engage with the end of spring 88 when the switch 28 is thrown back to the position shown in full lines in Fig. 3 and press this spring 88 downward, thus releasing stop 89 from engagement with the teeth on the ratchet and also causing spring 91 to throw pawl 86 out of engagement with the ratchet. The pressing downward by hand of arm 76, Fig. 7, will therefore throw the parts into the position shown in Figs. 10 and 7, and at the same time on the release of the ratchet 85 the spring 90 will throw the switch-shaft of switch 83 back into its normal position. Both switches will therefore be set in their normal position by the setting of one.

When a variation in the electrical condition of the protective circuit by a break in either the first circuit or the second circuit occurs, either the electromagnet I or H will be deenergized, allowing its armature to spring to the right and close the circuit through battery 22, thus starting the talking-machine. The magnet 23 will not, however, be energized.

To send in a trouble-alarm when a variation in the protective circuit occurs by one of the circuits becoming grounded, I have connected one end of the winding of magnet J to the ground, as at G, and have connected the other end to the winding of "fire-magnet" K. When, therefore, a ground occurs on either the first or the second circuit, a circuit will be completed through the "fire" and "ground" magnets in series. To prevent the fire-magnet being actuated when the ground occurs, I have wound the ground-magnet with many turns of fine wire and the fire-magnet with a few turns of large wire. This will provide sufficient ampere-turns in the ground-magnet to actuate the same with a current which is not strong enough to energize the fire-magnet. The trouble-alarm will therefore be sent in as before.

When the switch 28 is thrown and the second line of contacts is made, an annunciator A', B', or C' will be dropped to show the location of the trouble.

It will be obvious that many changes may be made in the constructions herein disclosed without departing from the spirit of my in-

vention. I therefore do not desire to be limited to the particular embodiments shown and described.

Whenever the apparatus is used as a burglar or other alarm, a suitable circuit-closing device instead of a thermostat should be employed.

What I claim is—

1. In a talking-machine in combination, a record, a reproducer and means to cause the reproducer to pass over the record a plurality of times, means to stop said machine including an electric circuit and a switch in said circuit, and means to automatically actuate said switch after said record has been passed over a given number of times.

2. In a talking-machine in combination, a record, a reproducer, means to cause the reproducer to pass over the record a plurality of times, means to stop said machine including an electric circuit and a switch in said circuit having as a part thereof a ratchet and a pawl engaging the same and reciprocated at each traverse of the reproducer, and means to automatically actuate said switch after said record has been passed over a given number of times.

3. In a talking-machine in combination, a record, a reproducer and means to cause the reproducer to automatically pass over the record a plurality of times, means to stop said machine including an electric circuit and a switch in said circuit having a rotatable barrel, a ratchet, and a pawl engaging said ratchet, said ratchet being reciprocated at each traverse of said reproducer and a catch to hold said ratchet, and means to automatically actuate said switch after said record has been passed over a given number of times.

4. In combination, a talking-machine, automatic means to cause said machine to repeat the message a plurality of times, means to stop said machine including an electric circuit and a switch therein adapted to be automatically thrown to stop said machine after the message has been repeated a plurality of times, a second switch adapted to be automatically thrown, and a connection between said two switches whereby by the movement of one switch to its normal position both switches are automatically set.

5. In combination, a talking-machine, automatic means to cause said machine to repeat the message a plurality of times, means to stop said machine including an electric circuit and a switch therein adapted to be automatically thrown to break said circuit and stop said machine after the message has been repeated a plurality of times, a spring-actuated switch adapted to be automatically thrown, and a connection between said two switches whereby by the movement of one switch to its normal position both switches are automatically set.

6. In combination, a talking-machine, au-

tomatic means to cause said machine to repeat the message a plurality of times, means to stop said machine including an electric circuit and a spring-actuated switch therein adapted to be automatically thrown to break said circuit and stop said machine after the message has been repeated a plurality of times, a second spring-actuated switch adapted to be automatically thrown, a connection between said two switches whereby by the movement of one switch to its normal position both switches are automatically set.

7. In an automatically-operating switch in combination, a rotating carrier provided with contact-terminals, stationary spring contact-strips pressing against said terminals, a spring tending to rotate said carrier in one direction and a catch to hold said carrier from so rotating, and means to automatically release said catch and allow said spring to rotate said carrier.

8. In an automatically-operating switch in combination, a rotating carrier provided with contact-terminals, stationary spring contact-strips pressing against said terminals, a spring tending to rotate said carrier in one direction, a catch to hold said carrier from so rotating including an arm on said carrier and a movable stop in the path of said arm, and means to automatically release said catch and allow said spring to rotate said carrier.

9. In an automatically-operating switch in combination, a rotating carrier provided with contact-terminals, stationary contact-terminals, stationary spring contact-strips adapted to spring toward said stationary terminals but pressed away from the same by said terminals on said carrier, a spring tending to rotate said carrier in one direction, a catch to hold said carrier from so rotating, and means to automatically release said catch and allow said spring to rotate said carrier and release said spring-strips.

10. In an automatically-operating switch in combination, a rotating carrier provided with contact-terminals projecting from both sides thereof, electric circuits connected to said terminals, stationary contact-terminals, connections to said latter terminals, stationary spring contact-strips on each side of said carrier adapted to spring toward and contact with said stationary terminals but pressed away from the same by said projecting terminals on said carrier, a spring tending to rotate said carrier in a direction to release said spring contact-strips and allow the same to press against said stationary terminals, a catch to hold said carrier from so rotating, and means to automatically release said catch and allow said spring to rotate said carrier.

FELIX MCGLOIN.

Witnesses:

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No. 668,154.

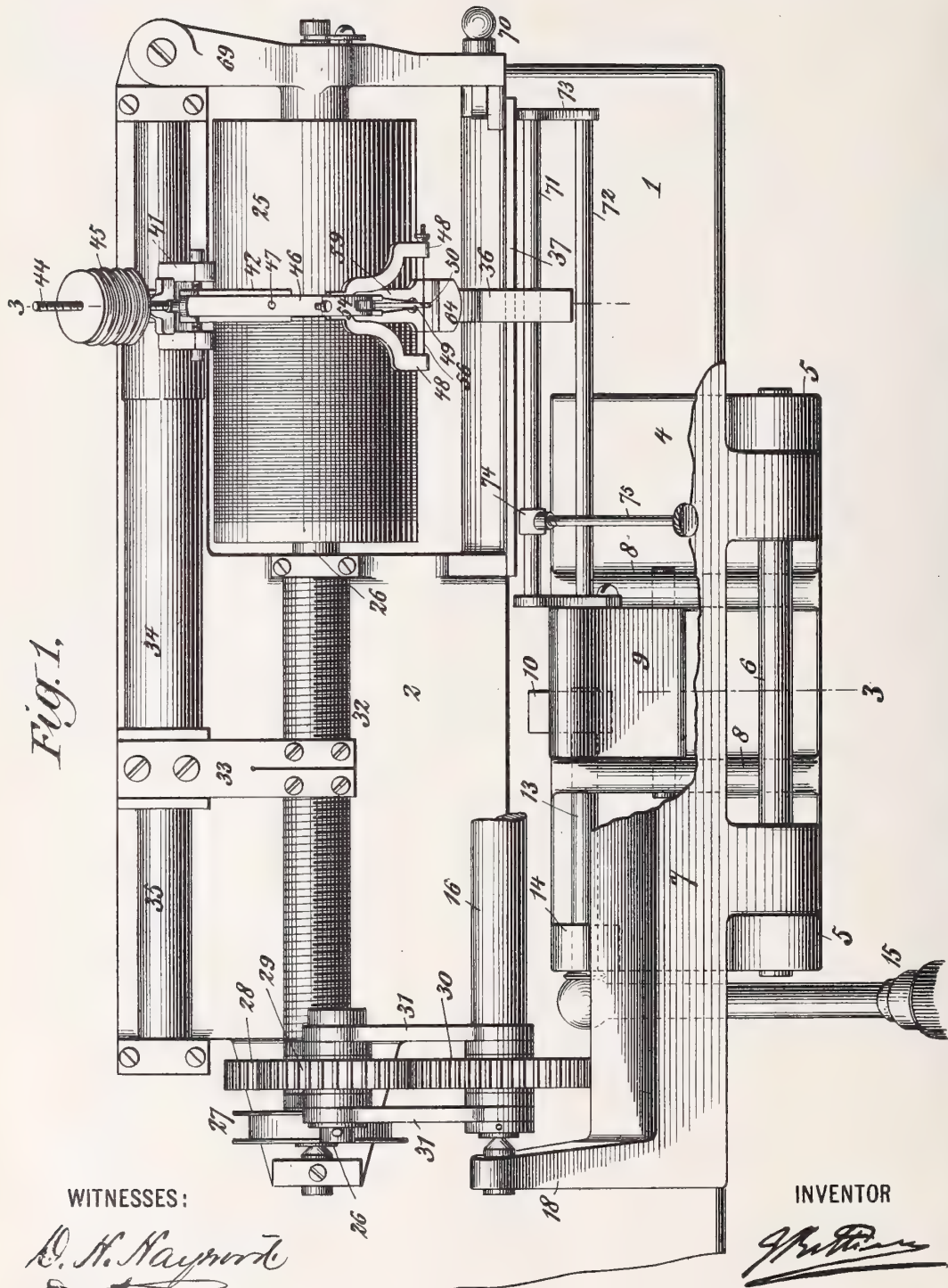
Patented Feb. 19, 1901.

G. BETTINI.
PHONOGRAPH RECORD DUPLICATOR.

(No Model.)

(Application filed July 27, 1897.)

5 Sheets—Sheet 1.



No. 668,154.

Patented Feb. 19, 1901.

G. BETTINI.

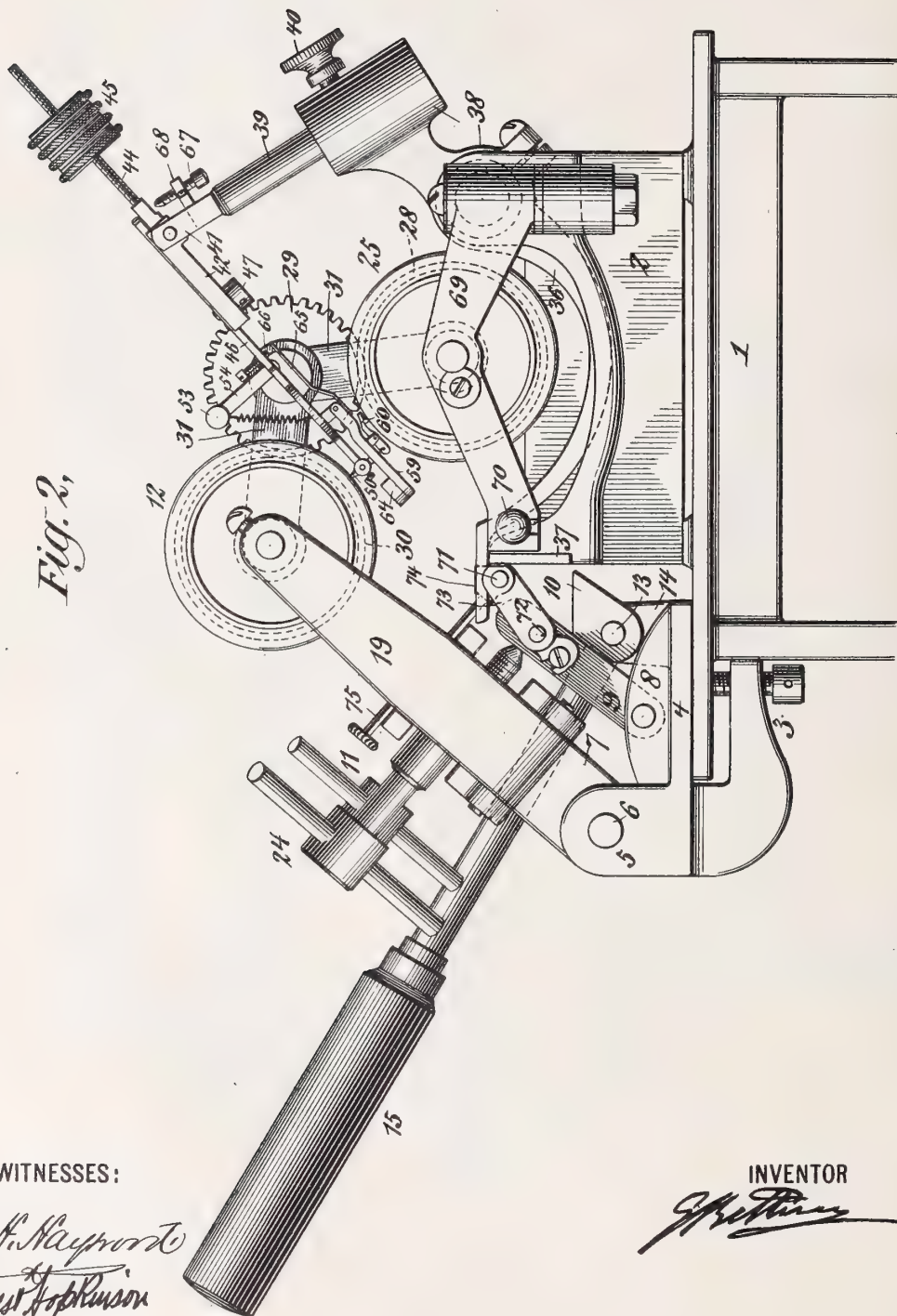
PHONOGRAPH RECORD DUPLICATOR.

(Application filed July 27, 1897.)

(No Model.)

5 Sheets—Sheet 2.

Fig. 2,



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No. 668,154.

Patented Feb. 19, 1901.

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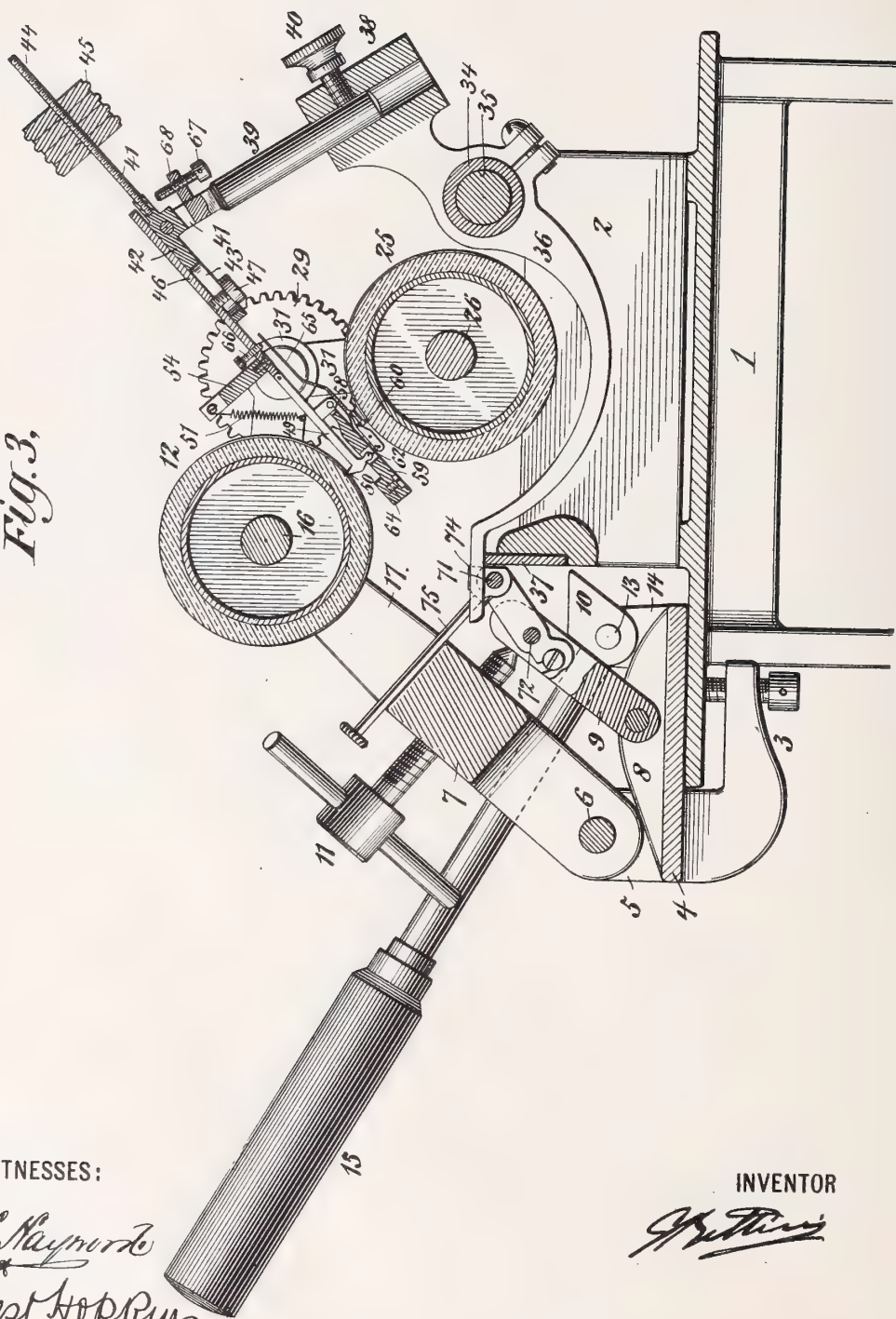
PHONOGRAPH RECORD DUPLICATOR.

(Application filed July 27, 1897.)

(No Model.)

5 Sheets—Sheet 3.

Fig. 3.



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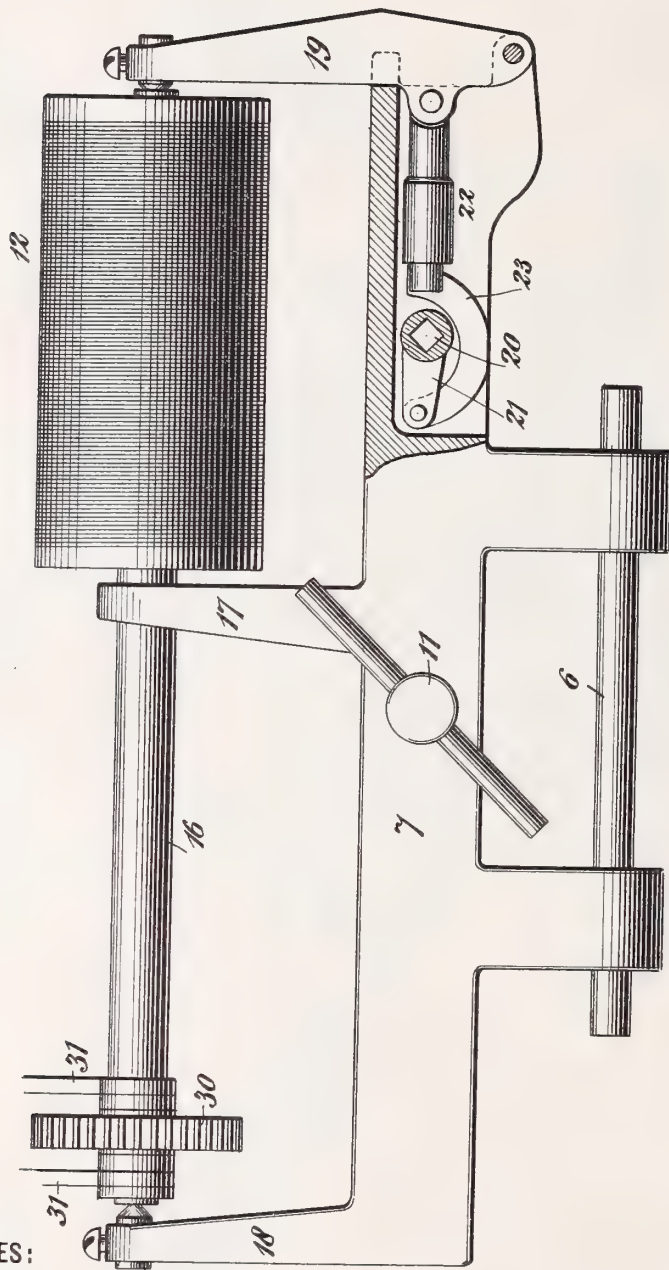
G. BETTINI.
PHONOGRAPH RECORD DUPLICATOR.

(No Model.)

(Application filed July 27, 1897.)

5 Sheets—Sheet 4.

Fig. 4.



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PHONOGRAPH RECORD DUPLICATOR.

(Application filed July 27, 1897.)

(No Model.)

5 Sheets—Sheet 5.

Fig. 5,

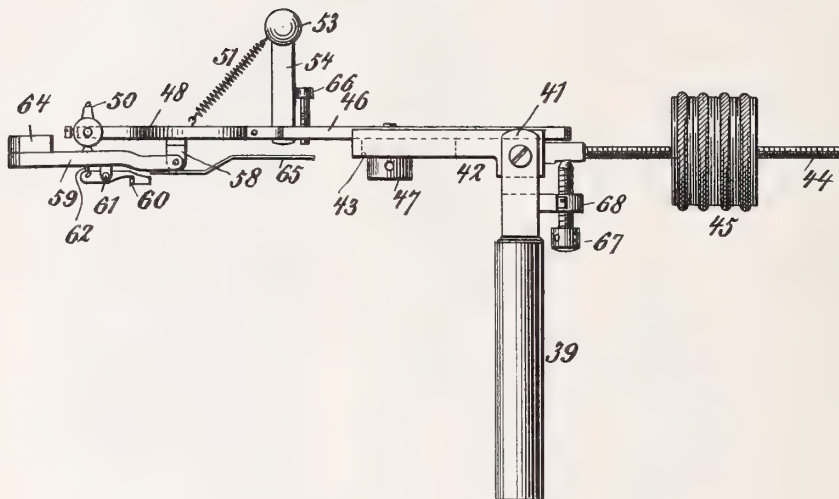


Fig. 6,

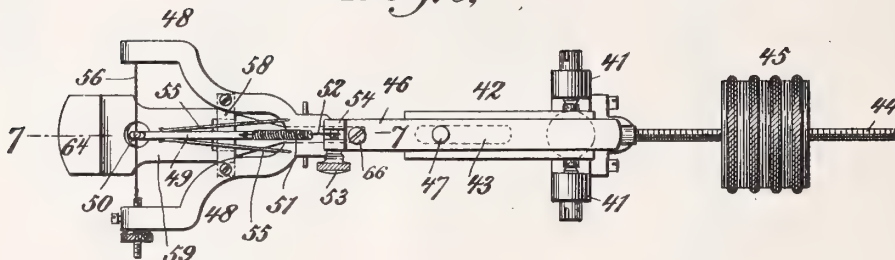
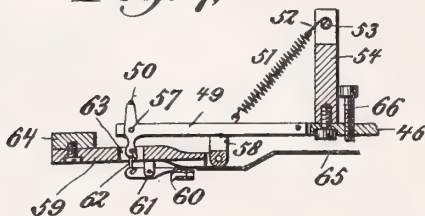


Fig. 7,



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Ernest L. Pinson

INVENTOR

G. Bettini

UNITED STATES PATENT OFFICE.

GIANNI BETTINI, OF NEW YORK, N. Y., ASSIGNOR OF ONE-HALF TO EDWARD N. DICKERSON, OF SAME PLACE.

PHONOGRAPH-RECORD DUPLICATOR.

SPECIFICATION forming part of Letters Patent No. 668,154, dated February 19, 1901.

Application filed July 27, 1897. Serial No. 646,072. (No model.)

To all whom it may concern.

Be it known that I, GIANNI BETTINI, of the city, county, and State of New York, have invented certain new and useful Improvements in Sound-Record Duplicators, of which the following is a specification.

The present invention relates to machines for reproducing the sound-waves recorded upon a suitable surface and making a duplication of such sound-waves upon a second surface.

In the drawings I have shown a construction embodying the features of the present invention, in which drawings—

Figure 1 is a plan view, certain parts being broken away. Fig. 2 is an end elevational view. Fig. 3 is a section along line 3 3 of Fig. 1. Fig. 4 is a detail view in plan of parts shown in Figs. 2 and 3. Fig. 5 is a side elevation of the parts immediately connected with the record tracing and cutting devices. Fig. 6 is a plan view of the parts shown in Fig. 5, and Fig. 7 is a detail view in section along line 7 7 of Fig. 6.

Like figures of reference refer to like parts throughout the several views of the drawings.

Referring to the drawings in detail, 1 designates a suitable support upon which rests the frame 2 of the machine, which is secured to said support by a clamp 3, extending from a plate 4. Bosses 5 project upwardly from this plate, and a shaft 6, supporting the frame 7, which carries the master record-cylinder, is journaled therein. Also projecting from said plate 4 are webs 8, to which is pivotally secured a plate 9, whose under surface rests against a cam 10. An adjusting-screw 11 passes through the frame 7 and impinges against the upper surface of the plate 9. This adjusting-screw 11 is for the purpose of positioning the master record-cylinder 12 relatively to the record-following stylus. The record-cylinder is moved bodily into and out of operating position by means of the cam 10, which is secured to a shaft 13, journaled in uprights 14, projecting from the plate 4, the shaft 13 having secured to it an operating-handle 15.

The master-cylinder 12 is supported on a shaft 16, which shaft is journaled at approximately its middle portion in an arm 17, pro-

jecting from the frame 7, and is journaled at one end by a conical journal-point projecting from an arm 18 and at the opposite end by a similar journal-point upon a pivoted arm 19. This arm 19 is operated so as to be moved away from its position supporting the end of the shaft 16 by means of a sleeve 20, which is provided with a crank-arm 21, connected to a link 22, which is pivoted to the arm 19, said link 22 being provided with an arc-shaped portion 23. The sleeve 20 is provided with an interior square-shaped opening and is operated by the handle 24, having a square end fitting into the opening in the sleeve 20. By these means the arm 19 is moved away from its position opposite the end of the master record-cylinder 12, so that the master record-cylinder may be taken off of its support and a new record-cylinder placed in position. The cylinder upon which the sound-record of the master-cylinder is to be duplicated is here designated by the numeral 25, and is supported in a position below and to one side of the master-cylinder upon a shaft 26, one end of which is provided with a driving-pulley 27 and a gear-wheel 28, meshing with a gear-wheel 29, which in turn meshes with gear-wheel 30 on shaft 16, which carries the master record-cylinder. The gear-wheels 28, 29, and 30 are connected together by links 31, so as to be always in mesh throughout all variations in position relatively to each other of the master record-cylinder and the cylinder upon which the record is to be duplicated. The shaft 26 is provided with a threaded portion 32, upon which bears a half-round threaded yoke secured to arm 33, whose other end is connected to a sleeve 34 on shaft 35. The sleeve 34 carries the record tracing and duplicating parts and is moved longitudinally of the cylinders at a rate bearing a definite relation to the rate of rotation of the master-cylinder and the cylinder upon which the sound-record of the master-cylinder is to be duplicated.

Clamped upon the sleeve 34 is an arm 36, which extends underneath the cylinder which is to receive the duplication of the sound-record, the end of said arm normally resting upon the rail 37. Formed integrally with said arm 36 is a housing 38, which is adapted to receive a

post 39, upon which are pivotally mounted the record-duplicating parts. The post 39 may be secured in any desired position by means of the set-screws 40. At its upper portion the post 39 branches into forks 41, between which is journaled a channel-piece 42, provided with a slot 43. Projecting rearwardly from the channel-piece 42 is a threaded rod 44, upon which is screwed a counterweight 45, said counterweight being designed to counterbalance the weight of the reproducing-stylus and appurtenant parts. An arm 46 is adapted to fit in the channel-piece 42, being secured therein so as to have longitudinal adjustment by means of a set-screw 47, passing through the slot 43 in the channel-piece. The arm 46 is bifurcated at its outer end into arms 48. Hinged between these arms 48 is the stylus-carrying arm 49, which is provided with a stylus 50. A spring 51 is secured at one end to the arm 49, and the other end is secured to a cord 52, fastened to a thumb-screw 53 on a post 54, the turning of the thumb-screw 53 adjusting the tension of the spring by winding or unwinding the cord 52. Upon each side of the stylus-carrying arm 49 bears a leaf-spring 55, operating to maintain the stylus-carrying arm 49 in alinement with the line running longitudinally through the center of the arm 46. Stretched between the arms 48 is a wire 56, which passes through an eye 57, formed in the stylus 50, and maintains the arm 49 in a plane substantially parallel with the plane of the arm 46. Hinged on a cross-piece 58, extending transversely between the arms 48, is a supporting-piece 59 for the record-cutting stylus 60, which is pivoted on a projection 61 on the supporting-piece 59. The record-cutting stylus is secured to the tracing-stylus 50 by any desired means, as by a wire 62, passing through the aperture 63. The outer end of the supporting-piece 59 is provided with a weight 64 and the opposite end with a tail-piece 65, whose limit of movement is defined by a set-screw 66. For the purpose of limiting the oscillation of the channel-piece 42, upon which are supported the stylus-carrying parts, I provide a set-screw 67, passing through a threaded hole in a lug 68, projecting from the post 39.

An arm 69 carries a cone-bearing adapted to engage the shaft 26 and is hinged, so as to be capable of movement into and out of supporting position for the purpose of removing the cylinder 25, and is locked in its closed position by means of a catch 70.

When a master-cylinder has been copied and its record duplicated on the cylinder 25, the operating-handle 15 is pressed down, thus turning the cam 10 and raising the master-record out of contact with the record-tracing stylus 50. The cutting-stylus is then raised from contact with the cylinder 25 by tilting the arm 36 by means of the rod 71 lifting the same, the rod 71 extending under the end of the arm 36 throughout the length of its path of

movement longitudinally of the phonograph-cylinders. The rod 71 and the rod 72, which are connected by end pieces 73, are secured to the plate 9 and are moved with said plate when it is tilted by a cam 10. A limiting-stop 74 is secured on the rod 71 and is adapted to be secured in any desired position by means of a set-screw 75.

What I claim as new is—

1. In an apparatus for duplicating sound-records, the combination of two moving surfaces, one of which carries a sound-record, means for duplicating the sound-record of one of said moving surfaces upon the other, and means for moving one of said moving surfaces away from the sound-record-duplicating parts and moving the sound-record-duplicating parts out of contact with the other moving surface, substantially as specified.

2. In an apparatus for duplicating sound-records, the combination of a pivotally-mounted record-cylinder, pivotally-mounted sound-duplicating parts, a second cylinder, and means for simultaneously moving the record-cylinder out of contact with the sound-duplicating parts and the sound-duplicating parts out of contact with the second cylinder, substantially as specified.

3. The combination of a rotatably-mounted cylinder, a pivoted support for one end of said cylinder, a link connected to said pivoted support, and a crank to which said link is secured, substantially as specified.

4. The combination of a rotatably-mounted cylinder, a pivoted support for one end of said cylinder, a link connected to said pivoted support and provided with an arc-shaped portion, and a crank connected to said arc-shaped portion, substantially as specified.

5. In an apparatus for duplicating sound-records, the combination of two moving surfaces, a sound-record-duplicating part, means for adjusting the position of one of said moving surfaces relatively to the sound-record-duplicating part, and means for moving said record-surface away from the sound-record-duplicating part and said part away from the other moving surface, substantially as specified.

6. In an apparatus for duplicating sound-records, the combination of two moving surfaces, an adjustably-mounted sound-record-duplicating part, means for adjusting the position of one of said moving surfaces relatively to the sound-record-duplicating part, and means for moving said record-surface away from the sound-record-duplicating part, and said part away from the other moving surface, substantially as specified.

7. In an apparatus for duplicating sound-records, a counterbalanced pivoted support, an arm carrying a tracing-stylus hinged to said support, lateral guides for said arm, and means for holding the tracing-stylus arm in substantially the same horizontal plane as the pivoted support, substantially as specified.

8. In an apparatus for duplicating sound-
records, the combination of a longitudinally-
adjustable support, a tracing-stylus pivoted
thereon, an independently-pivoted cutting-
stylus and a connection between the tracing-
stylus and cutting-stylus, substantially as
specified.

In testimony whereof I have signed my
name to this specification in the presence of
two subscribing witnesses.

GIANNI BETTINI.

Witnesses:

E. D. GREENE,

B. L. CLARKE.





No. 668,183.

Patented Feb. 19, 1901.

B. B. HILL.
PHONOGRAPH REPRODUCER.

(Application filed Jan. 31, 1899.)

(No Model.)

Fig. 1

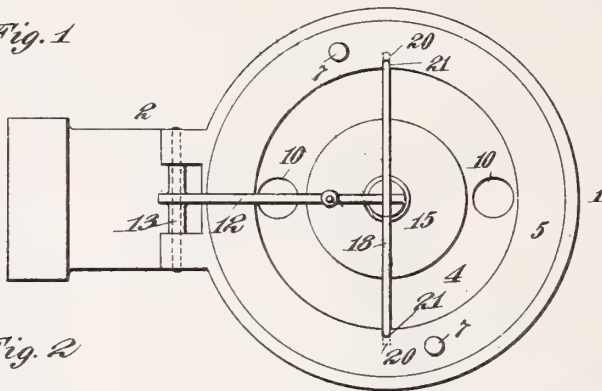


Fig. 2

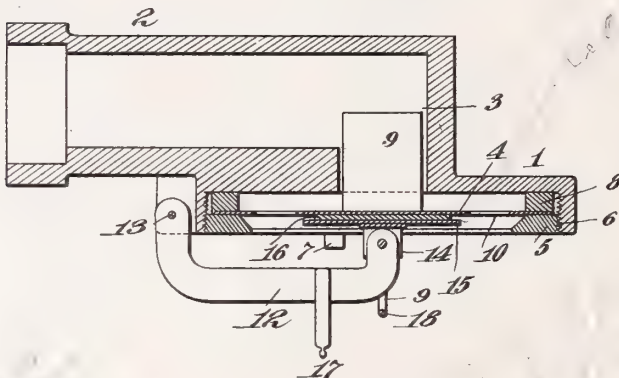


Fig. 3

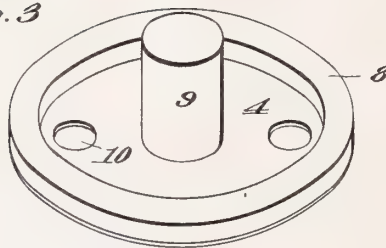
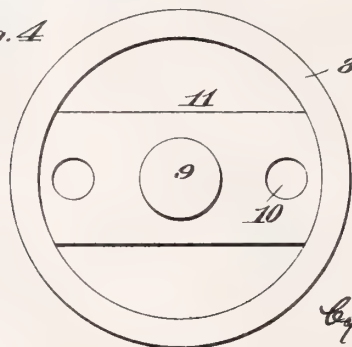


Fig. 4



Witnesses:

Joost. P. P. P.
Archibald G. P. P.

Inventor
Barton B. Hill
By Rich. M. Dyer
Atty

UNITED STATES PATENT OFFICE.

BARTON B. HILL, OF PARIS, FRANCE.

PHONOGRAPH-REPRODUCER.

SPECIFICATION forming part of Letters Patent No. 668,183, dated February 19, 1901.

Application filed January 31, 1899. Serial No. 703,973. (No model.)

To all whom it may concern:

Be it known that I, BARTON B. HILL, a citizen of the United States, residing at Paris, in the Republic of France, have invented certain new and useful Improvements in Reproducers for Phonographs and Graphophones, of which the following is a specification.

My invention relates to various new and useful improvements in reproducers for phonographs or graphophones; and the particular object of the invention is to provide a reproducer for this purpose which will be capable of more accurate and delicate reproduction than the devices at present in use.

In carrying out my invention I utilize diaphragms or the equivalents thereof made of different materials especially adapted for the particular class of reproduction desired, such diaphragms being adapted to be removably carried in the usual reproducing-frame and to be vibrated by the usual reproducing point or ball.

In order that my invention may be better understood, attention is directed to the accompanying drawings, forming a part of this specification, and in which—

Figure 1 is a plan view from beneath of a well-known form of graphophonic reproducer embodying my present improvements; Fig. 2, a vertical section of the device, illustrating the preferable form of diaphragm; Fig. 3, a perspective view, on an enlarged scale, of the preferred construction of diaphragm; and Fig. 4, a plan view of a modified construction of diaphragm.

In all of the above views corresponding parts are represented by the same numerals of reference.

The reproducer illustrated in Figs. 1 and 2 comprises a flat circular chambered head 1, carried by a tube 2, to which the listening tubes or horn is secured in the usual way. The tube 2 communicates with the chamber in the head 1 by a passage 3, opening centrally in the chamber. Located within the chamber of the reproducer-head is a diaphragm 4, which is preferably secured in place by a ring 5, engaging the threads 6. This ring 5 is provided with one or more small studs 7 therein, by which it may be screwed

or unscrewed for the removal and replacing of the diaphragm. The diaphragm 4 may be carried on a ring or frame 8, made, preferably, of celluloid or rubber, whereby the said ring will not shrink or warp. Obviously, however, the diaphragm may be perfectly flat, or instead of being secured upon an annular ring, as described, it may rest upon a separate cushion or buffer of a slightly-elastic material, such as ordinary blotting-paper. The diaphragm 4 is made of any material suitable for the specific variety of reproduction desired. I have experimented with excellent results with diaphragms made of glass, gold-beaters' skin, photographic film, wood, and metal. Any other suitable material may be employed for the construction of the diaphragms. Preferably, also, the diaphragm is provided at its center with a cylindrical air-hammer 9, consisting simply of a block, such as wood, which fits more or less closely within the passage 3. I find that by the employment of an air-hammer secured to the diaphragm as explained the vibration of the diaphragm causes the air-hammer to vibrate within the passage, setting up air-vibrations in the passage in exact accordance with the sound-record, resulting in very perfect reproductions and eliminating to a large extent extraneous and disagreeable sounds. Obviously, however, such an air-hammer may be dispensed with and the diaphragm employed for setting up air-vibrations in the reproducer-chamber, which vibrations will be transmitted through the passage 3 and tube 2 to the ear. I find that best results are also secured by providing the diaphragm 4 with one or more perforations 10 therein, thereby increasing the flexibility of the diaphragm and eliminating false tones. Instead of making use of a diaphragm 4, as explained, occupying substantially the entire area between the walls inclosed by the reproducer-chamber a diaphragm in the form of a comparatively narrow strip 11 may be used, as shown in Fig. 4.

Movement from the sound-record is communicated to the diaphragm in any suitable way; but the connection should be so arranged as to enable the diaphragms to be readily removed and substituted by others to

better reproduce the particular form of record desired. The preferable construction of these devices is illustrated in Figs. 1 and 2.

12 represents a reproducing-arm pivoted at one side on a pin 13 and pivoted at its end to a stud 14, secured to a disk 15 of smaller diameter than the diaphragm. The disk 15 is made of any suitable material, such as celluloid or photographic film. This disk 15 may rest directly upon the diaphragm 4, or a buffer 16 may be interposed between the disk and the diaphragm, as shown in Fig. 2. This buffer is made of any suitable slightly-elastic material, such as rubber or blotting-paper. The reproducing-lever 12 carries the reproducing pin or ball 17, as is common, which bears upon the record and vibrates the lever 12. The weight of the reproducer-head maintains the reproducer-ball in contact with the record and keeps the disk 15 in engagement with the diaphragm. In order to prevent the reproducing-lever 12 from falling out of position when the reproducer is elevated for the insertion of a record on the mandrel of the phonograph or graphophone, I prefer to employ a small bridge or retaining piece 18, located immediately beneath the free end of the lever 12. This bridge or retaining piece is provided with downturned legs 19 and downturned toes 20, which are inserted in recesses 21 in the retaining-ring 5, being held in place by the elasticity of the piece. When a new diaphragm is to be inserted in position, the bridge-piece 18 is removed, allowing the re-

35 taining-ring 5 to be unscrewed, disclosing the diaphragm, which may be then removed and a new diaphragm substituted.

I find in practice that by employing reproducers as I have explained and by making use of diaphragms of different materials to suit the particular reproduction desired a phonograph or graphophone can be produced wherein very perfect reproduction can be secured and wherein false and extraneous tones will be largely eliminated. At the same time the device is so constructed that the diaphragms can be readily removed and secured in position when desired, and the cost is but very slightly increased. 45

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is— 50

In a phonograph or graphophone, the combination with a reproducing device, of a reproducing-diaphragm adapted to be removably secured in place within the reproducing device, a lever pivoted to the reproducer and carrying a reproducing-stylus which is maintained in contact with the diaphragm by the weight of the reproducer, and a removable bridge-piece engaging beneath said lever, substantially as set forth. 60

This specification signed and witnessed this 3d day of January, 1899.

BARTON B. HILL.

Witnesses:

EDWARD P. MACLEAN,
GEORGE E. LIGHT.

No. 668,230.

Patented Feb. 19, 1901.

J. W. STEELE.
GRAPHOPHONE SHAVING DEVICE.

(Application filed Apr. 4, 1900.)

(No Model.)

Fig. 1.

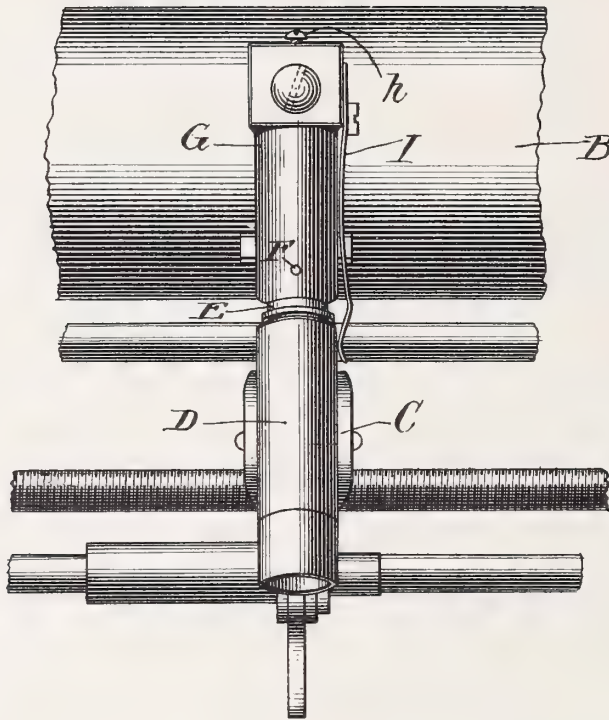


Fig. 2.

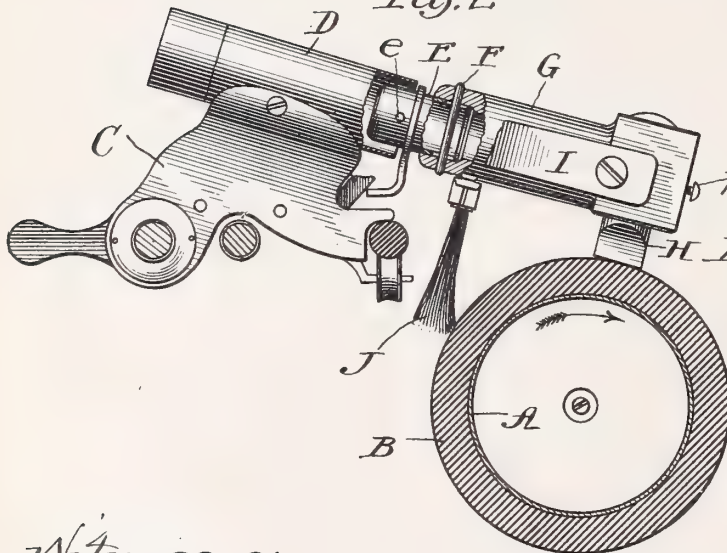


Fig. 3.

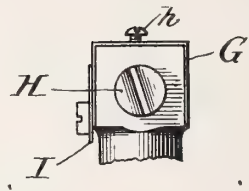
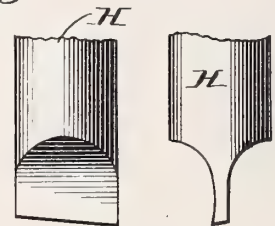


Fig. 4.

Fig. 5.



Witnesses:

Frank S. Blanchard
Harold E. Bennett.

Inventor:

John W. Steele

By Ernest Hopkins
Attorneys

UNITED STATES PATENT OFFICE.

JOHN W. STEELE, OF CHICAGO, ILLINOIS.

GRAPHOPHONE SHAVING DEVICE.

SPECIFICATION forming part of Letters Patent No. 668,230, dated February 19, 1901.

Application filed April 4, 1900. Serial No. 11,480. (No model.)

To all whom it may concern:

Be it known that I, JOHN W. STEELE, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Machines for Shaving Cylinders of Graphophones and other Talking-Machines, of which the following is a specification.

The object of the present invention is to provide a simple, inexpensive, and efficient device that may be attached directly to a graphophone or other talking-machine in place of the recorder or reproducer and which when so attached will shave the cylinder and leave it with a surface finished and ready for receiving another record.

The invention consists in the features of novelty that are herein described, and in order that it may be fully understood I will describe it with reference to the accompanying drawings, which are made a part of this specification, and in which—

Figure 1 is a plan view of a portion of a graphophone with my improved shaving-knife in place. Fig. 2 is a sectional elevation thereof with portions broken away. Figs. 3, 4, and 5 are enlarged detail views of the cutting-blade.

A represents the mandrel of a graphophone, and B a wax record-cylinder in place thereon. The motor for driving the mandrel is not shown:

C is the carriage, which carries the tubular connection D for the recorder or reproducer with the recording or reproducing trumpet. At one end of this tubular connection is a short sleeve or tube E, supported by a horizontal pin *e*, so that it is capable of free oscillation in a vertical plane. This sleeve E has in its free outer end notches disposed in a vertical plane and adapted to receive the vertical pin in the stem of the recorder or reproducer. In like manner I make use of these notches for receiving a vertical pin F, which passes through the tubular shank of the stock of the shaving-knife G, which tubular shank is slipped over the outer end of the tubular

sleeve E. The knife as a whole comprises a stock of suitable construction and weight having a vertical opening in which fits the blade H, said blade being held in place by a set-screw *h*. This knife when substituted for the recorder or reproducer will be free to move in a vertical plane just as the recorder or reproducer moves; but it is restrained from any lateral or sidewise movement preferably by a plate-spring I, which is secured to the knife and bears against the tubular connection D. The blade of the knife is of such length, regard being had to the diameter of the cylinder being shaved, that the cylinder contacts with the blade at a point somewhere in rear of its toe or foremost corner. Furthermore, the blade is set at a slight angle to the plane of rotation for the purpose of producing a shearing cut. Its lower end is chamfered toward the rear side, and its front or cutting edge preferably has a very slight lip, which may be produced by hollow-grinding the front side of the blade.

Attached to the under side of the stem is a brush J, which is designed to have contact with the cylinder for the purpose of dislodging the shavings.

Having described my invention, what I claim as new therein, and desire to secure by Letters Patent, is—

1. In a machine of the class described, the combination with a revoluble mandrel, a traveling carriage, a sleeve E, and means for horizontally pivoting the sleeve to the carriage, of a shaving-knife comprising a blade, a stock in which it is mounted, a tubular shank adapted to engage the sleeve E, and a spring carried by the knife and engaging the carriage, substantially as set forth.

2. In a machine of the class described, the combination with a mandrel, a traveling carriage, a sleeve E provided in its outer end with vertically-disposed notches, and means for horizontally pivoting the sleeve to the carriage, of a shaving-knife comprising a blade, a stock in which it is mounted, a tubular shank adapted to engage the sleeve E, said shank carrying a vertical pin occupying the

notches of the sleeve, and a spring carried by the knife and engaging the carriage, substantially as set forth.

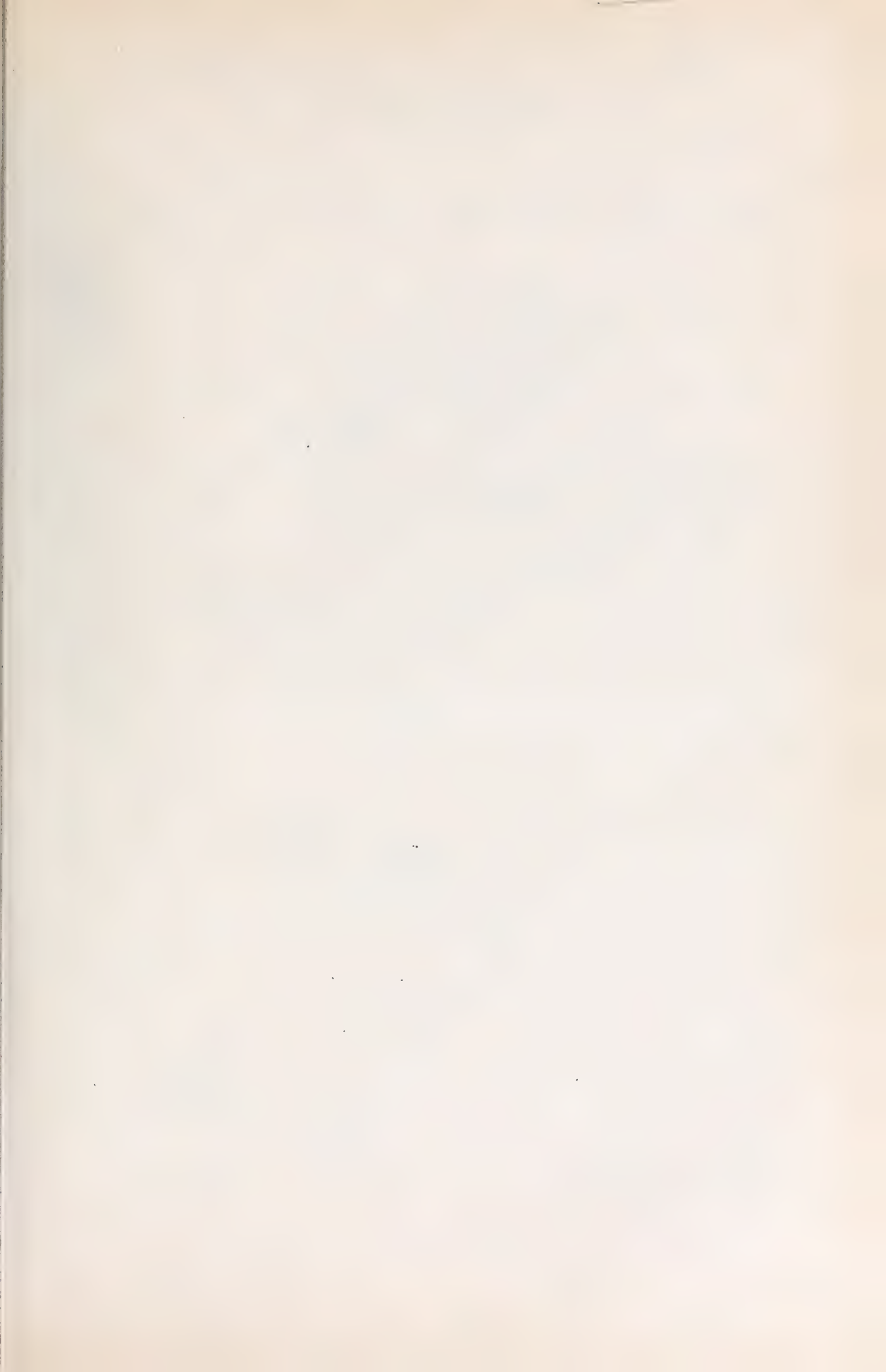
3. In a machine of the class described, the
5 combination with a mandrel, a traveling carriage, a sleeve E, and means for horizontally pivoting the sleeve to the carriage, of a shaving-knife comprising a blade, a stock, and

means for connecting the stock to the sleeve, said blade being beveled rearward and having 10 a slight lip at its forward edge, substantially as set forth.

JOHN W. STEELE.

Witnesses:

WILLIAM H. SHELDON,
H. V. HUFF.



No. 669,207.

Patented Mar. 5, 1901.

C. A. G. PRITCHARD.
GRAPHOPHONE RECORD SHAVER.

(Application filed Apr. 9, 1900.)

(No Model.)

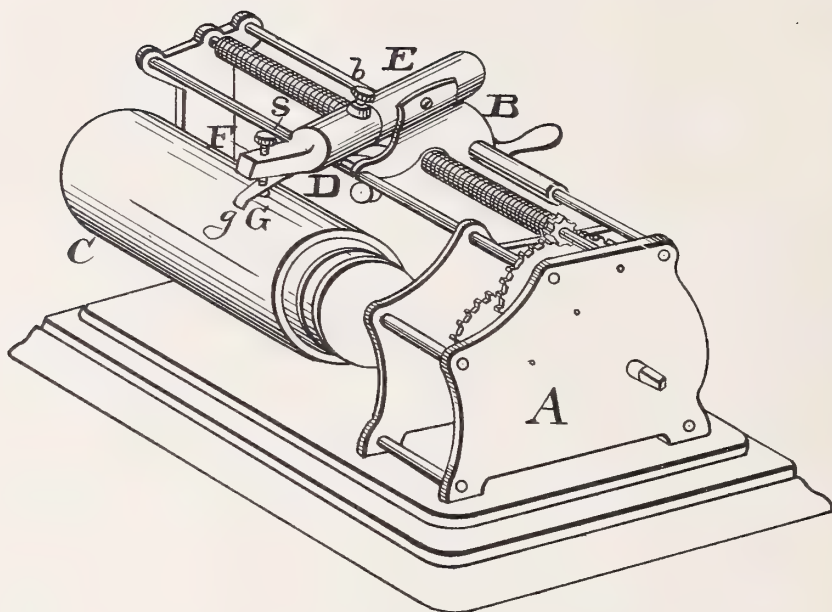


Fig. 1.

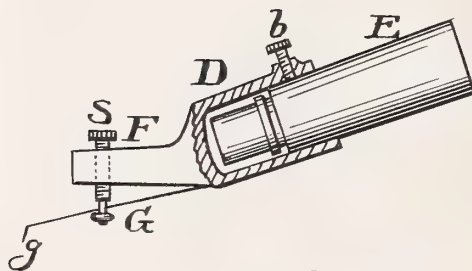


Fig. 2.

Witnesses,

Geo. B. Tibbitts
Charles L. Hooker.

Inventor,

Charles A. G. Pritchard.
per Geo. H. Tibbitts,
Attorney.

UNITED STATES PATENT OFFICE.

CHARLES A. G. PRITCHARD, OF CLEVELAND, OHIO.

GRAPHOPHONE-RECORD SHAVER.

SPECIFICATION forming part of Letters Patent No. 669,207, dated March 5, 1901.

Application filed April 9, 1900. Serial No. 12,221. (No model.)

To all whom it may concern:

Be it known that I, CHARLES A. G. PRITCHARD, a citizen of the United States of America, and a resident of the city of Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Graphophone-Record Shavers, of which the following is a specification.

This invention relates to an attachment to graphophones for shaving record-cylinders; and it consists in the new construction and adaptation of a cutting-tool attachable to the carriage in place of the reproducer or recorder, whereby the wax on the cylinder is delicately and smoothly shaved off, leaving the surface in excellent condition for again recording.

The object of the invention is to provide a cheap and simple device by which the owner of a graphophone may obliterate the record from a cylinder and use it again for recording. This device is applicable to small graphophones as well as large ones and only removes but about the thousandth part of an inch of the wax and is therefore very economical in its operation.

In the accompanying drawings, Figure 1 is a perspective view of a graphophone having my new shaving device attached. Fig. 2 is a detached side view, partly in section, of my new shaving device.

A represents the working parts of a graphophone.

B is the carriage, and C is a record-cylinder.

D is a cutting-tool holder consisting of a cap which can be placed on the pipe E on the carriage B, having a set-screw *b* for securing it in place, as seen in Fig. 1. F is an arm on

the end of said cap D, bent at a slight angle upward and which projects over the cylinder C. To the under side of said arm is attached a flexible cutting-tool G, consisting of a piece of thin steel having a fine cutting-point *g*, which engages with the surface of the cylinder. S is an adjusting-screw in the arm F, loosely attached to the cutting-tool, by which said cutter is nicely adjusted for shaving only a given or required amount from the surface without waste. The flexibility of the tool also renders it self-adjusting in and to the slight inequalities of the rotations of the cylinder.

With the use of this simple device a person may remove an old or undesirable record and then remove the shaver and attach the recorder and proceed to record a new song or piece of music.

Having described my invention, what I claim is—

In a graphophone, the combination with the pipe E and carriage, of the shaving attachment consisting of a cap D removably attached to the pipe E, arm F extending outward from said cap, a shaving-tool G consisting of a flat steel spring provided with a cutting-point *g*, secured to the under side of arm F, an adjusting-screw S in said arm and loosely attached to said cutting-tool, and operating substantially as and for the purpose specified.

Signed by me at Cleveland, Ohio, this 5th day of April, 1900.

CHARLES A. G. PRITCHARD.

Witnesses:

GEO. W. TIBBITTS,
CHARLES L. STOCKER.

No. 669,895.

Patented Mar. 12, 1901.

C. BURKHART.

SOUND BOX SUPPORT FOR GRAPHOPHONES.

(Application filed Apr. 4, 1900.)

(No Model.)

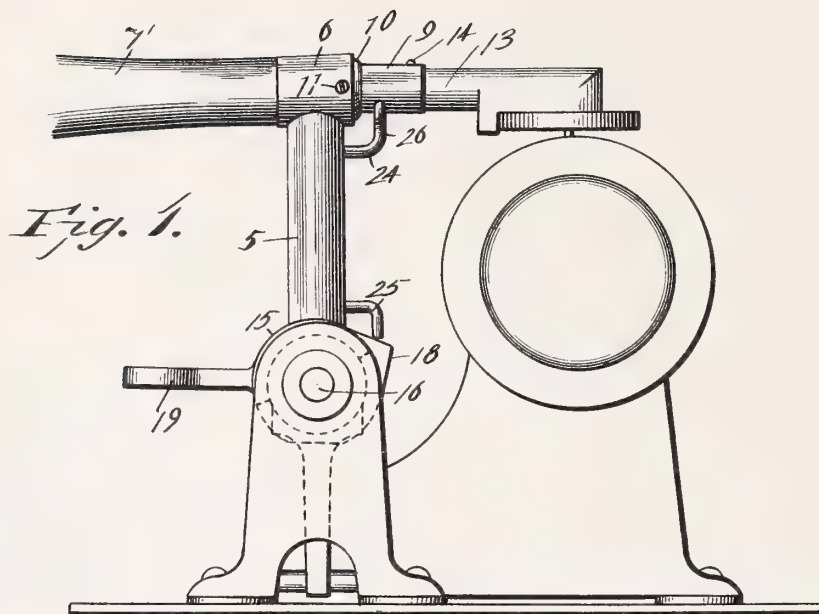
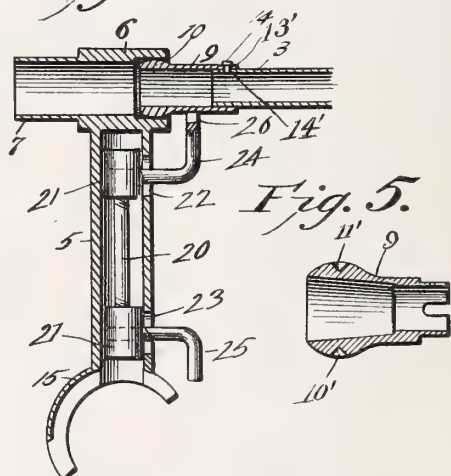
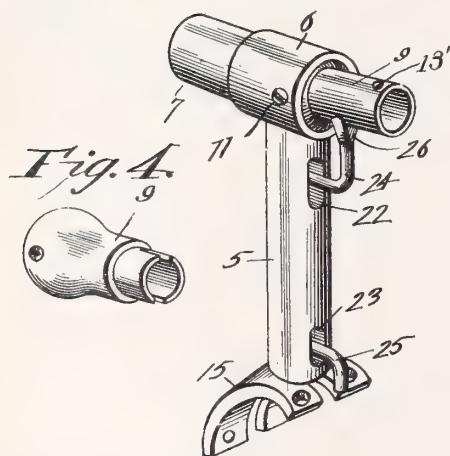


Fig. 2.

Fig. 3.



Witnesses
E. H. Walker By *his* Attorneys.
Geoff. Chandler

Charles Burkhardt Inventor
Ca Snow & Co.

UNITED STATES PATENT OFFICE.

CHARLES BURKHART, OF ALTOONA, PENNSYLVANIA.

SOUND-BOX SUPPORT FOR GRAPHOPHONES.

SPECIFICATION forming part of Letters Patent No. 669,895, dated March 12, 1901.

Application filed April 4, 1900. Serial No. 11,508. (No model.)

To all whom it may concern:

Be it known that I, CHARLES BURKHART, a citizen of the United States, residing at Altoona, in the county of Blair and State of Pennsylvania, have invented a new and useful Sound-Box Support for Graphophones, of which the following is a specification.

This invention relates to graphophones; and it has for its object to provide a support for the sound-box which will hold the box to make top contact of its stylus with the record in such manner that it may be readily raised and lowered by the operation of the usual lifting-lug.

In the drawings forming a portion of this specification, and in which like numerals of reference indicate similar parts in the several views, Figure 1 is a side elevation showing a graphophone and illustrating the operative positions of the record, the sound-box, and the present attachment. Fig. 2 is a perspective view showing the attachment removed from the feed-carriage. Fig. 3 is a vertical central section taken through the supporting attachment. Fig. 4 is a detail perspective view showing a modified form of the pivoted sound-tube which is adapted for engagement by the common form of sound-box. Fig. 5 is a longitudinal central section of the pivoted sound-tube and illustrating the depressions in which the pivot-screws are engaged.

Referring now to the drawings, the sound-box support comprises a hollow upright or post 5, at the upper end of which is a transverse tubular head 6, which lies at a right angle to the post, but which does not communicate with the interior of the post. One end 7 of the head 6 is reduced in diameter to receive the end of the sound-funnel 7', which is engaged thereover in the usual manner or to receive the usual ear-tubes.

A short sound-tube 9 has a section 10 of a ball at one end, the exterior diameter of which is approximately equal to the interior diameter of the head 6, into which this ball-section is fitted with sufficient looseness to permit the outer end of the short section to be raised and lowered. The ball is held against displacement from the head 6 by means of pivot-screws 11, which are engaged with threaded perforations in the sides of the head, so that they may be screwed inwardly to

engage their inner tapered ends with conical depressions 10' 11' at diametrically opposite points of the ball-head of the short sound-tube 9. Thus the outer end of the tube 9 may be raised and lowered to correspondingly move the sound-box, the sound-tube 13 of which is slipped into the outer end of the short tube 9 and is held therein by means of a pin 14, which is engaged with alining perforations 13' and 14' in the short tube 9 and the sound-tube 13, this pin 14 being of such length as not to reach into the inclosure of the pivoted tube 9, and thus not to interfere in any manner with the sound-waves passing therethrough. It will thus be seen that there is a clear passage for the sound-waves through the parts from the box to the funnel.

At the lower end of the post 5 is an enlarged base 15, which is arc-shaped and is bifurcated, the resultant legs extending at both sides of the post, as shown. The slot that forms the bifurcation is extended through the lower end of the post 5, and in practice the post is disposed with its arc-shaped base upon and receiving the upper portion of the feed-carriage, which latter is provided with a rounded portion which fits the base. The feed-carriage is carried by the usual screw 16, it being understood that the rotation of this screw feeds the carriage, and therewith the sound-box, along the record, the supporting attachment being held in place upon the carriage by means of screws, which are passed through perforations at the ends of the legs of the bifurcated base, said screws engaging threaded perforations in the carriage. The carriage carries a loose ring having a lug 18 at one side and a finger-piece 19 at the other side, this ring lying with its upper portion in the slot which bifurcates the base of the post 5 and with the lug projecting between the legs of the base in the direction of the record and with the finger-piece projecting between the legs of the base in an outward direction for ready manipulation by the operator. In the usual construction when this finger-piece is depressed the lug is raised and acts to raise the sound-box from the record, as shown in the patent to T. H. Macdonald, No. 579,595, granted March 30, 1897.

In order to provide for raising and lowering the sound-box when the finger-piece is de-

pressed, a rod is disposed within the tubular post 5, as shown at 20, and engaged with the ends of this rod are cylindrical blocks 21, which slidably fit the post. At the inner side of the post are formed two slots 22 and 23, which lie opposite to the blocks 21, and through these slots are passed two L-shaped rods or arms 24 and 25, the upper arm having its outer end turned upwardly and bifurcated to form a fork 26, which receives the short tube 9 outside of the head 6. The lower arm 25 has its outer end bent downwardly to lie against the lug 18. The rod 20 and arms 24 and 25 have threaded engagement with the blocks 21, so that they may be properly adjusted with respect to each other, and it will be seen that when the finger-piece is depressed to raise the lug the arms and rod will be likewise raised and the box will be lifted, with its stylus, away from the record. The lifting-rod 20 and its parts, it will be seen, are carried by and supported from the post 5, so that they form a part of the attachment, and thus when the post is put in place upon the graphophone the shifting or lifting mechanism is brought into proper operative relation to the lifting-lug 18. Hence the attachment is complete in itself and after being put in place it is only necessary to attach the sound-box and the funnel or ear-tubes thereto to prepare the machine for operation.

The specific construction and arrangement shown and described may be modified and any suitable materials and proportions may be used for the various parts without departing from the spirit of the invention, the construction being essentially an attachment for holding the box above the record and carrying the lifting mechanism.

When a sound-box having a cross-pin is used, the pivoted tube 9 has its outer end reduced in exterior diameter to fit into the free end of the tube of the box, and this reduced portion is slotted longitudinally to receive the cross-pin in the usual manner.

What is claimed is—

1. A sound-box support comprising a hollow post, a tubular head at the upper end of the post and lying at right angles thereto, a tube having an enlarged curvilinear end mounted in one end of the head, a reciprocatory rod within the post, said post having slots therein, and arms passed through the slots and engaged with the rod, the upper arm having its outer end bent upwardly and engaged with the pivoted tube and the lower arm having its outer end bent downwardly for engagement to lift the rod and raise the pivoted tube.

2. An attachment for graphophones comprising a supporting-post a sound-tube pivotally connected with the post and adapted for the connection of a sound-box thereto, said post being adapted for attachment to the feed-carriage of a graphophone, and a reciprocatory rod mounted in the post and having its ends projected therefrom and positioned to engage said sound-tube and the lifting-lug of the carriage respectively when the attachment is in operative position.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

CHARLES BURKHART.

Witnesses:

W. T. SHIELDS,
W. H. STEPHENS.

1861 12 24 1871

1871

1871

No. 670,442.

Patented Mar. 26, 1901.

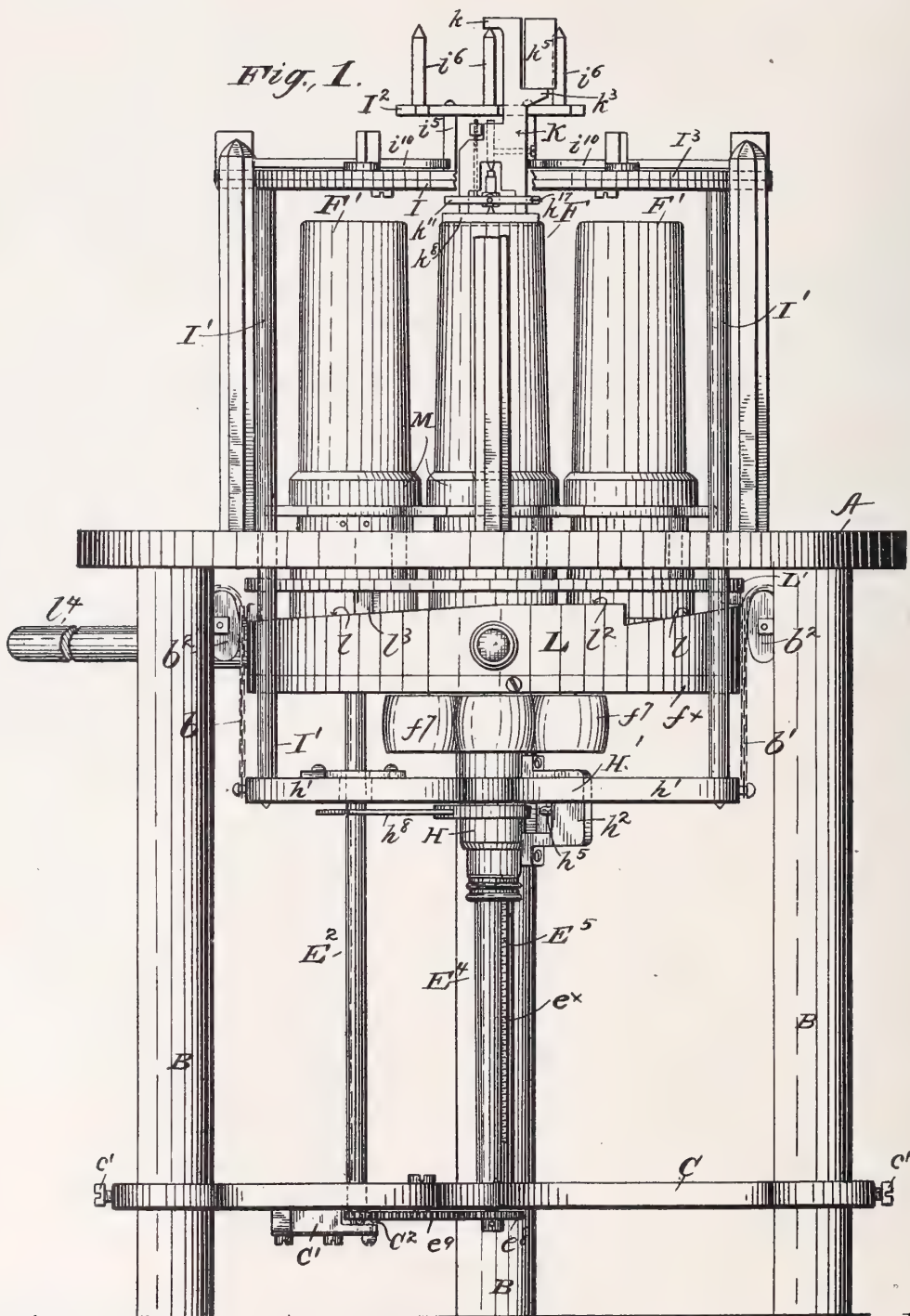
C. S. TAITER.

GRAPHOPHONE RECORD DUPLICATING MACHINE.

(Application filed Aug. 16, 1898.)

(No Model.)

11 Sheets—Sheet 1.



Witnesses.
H. R. Edison.

J. T. Cameron

Inventor
Charles S. Taiter
by Edward Mauro
his attorney



No. 670,442.

Patented Mar. 26, 1901.

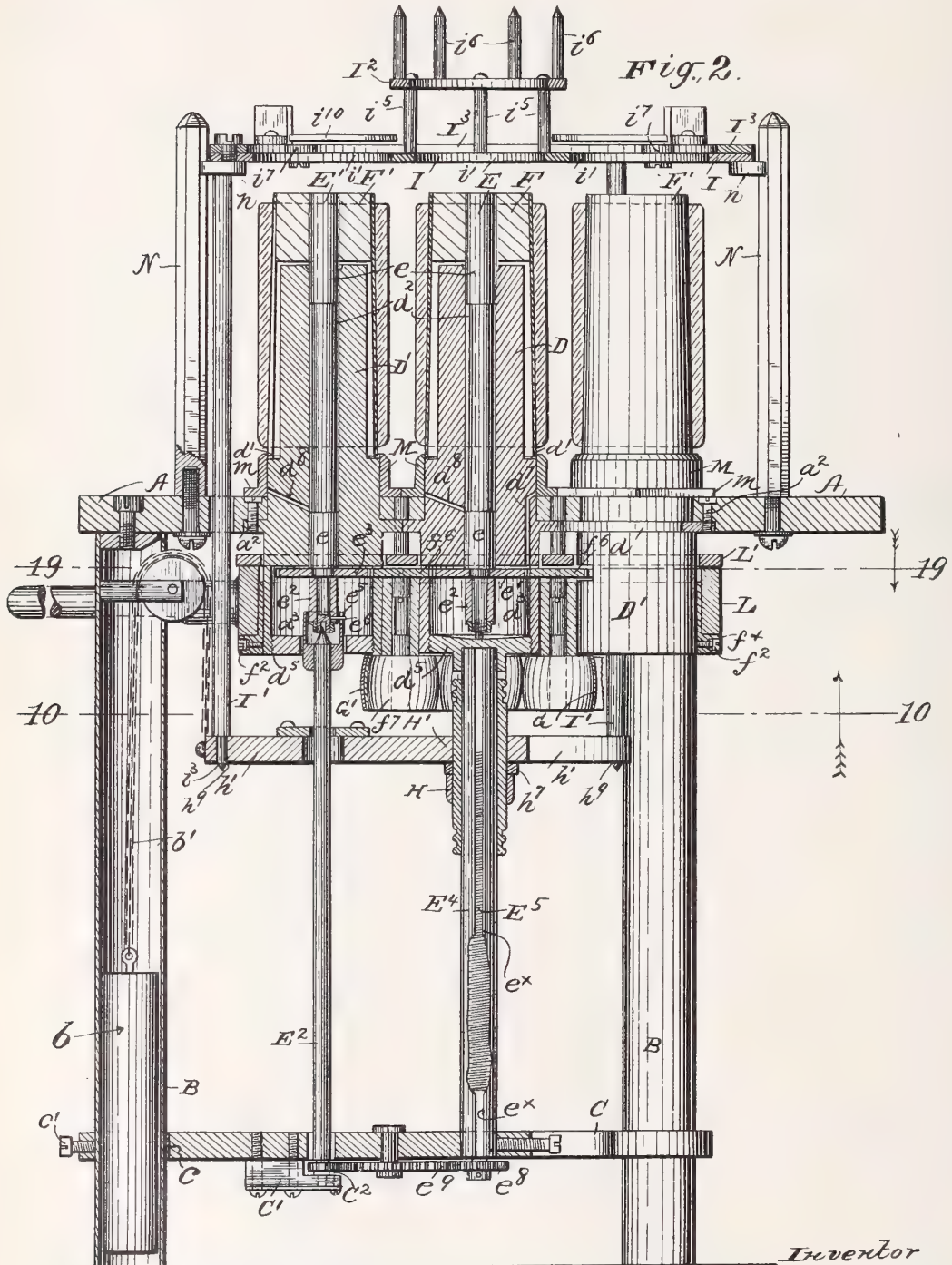
C. S. TAINTER.

GRAPHOPHONE RECORD DUPLICATING MACHINE.

(Application filed Aug. 16, 1898:)

(No Model.)

11 Sheets—Sheet 2.



Inventor

Witnesses
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No. 670,442.

Patented Mar. 26, 1901.

C. S. TAITER.
GRAPHOPHONE RECORD DUPLICATING MACHINE.

(Application filed Aug. 16, 1898.)

(No Model.)

11 Sheets—Sheet 3.

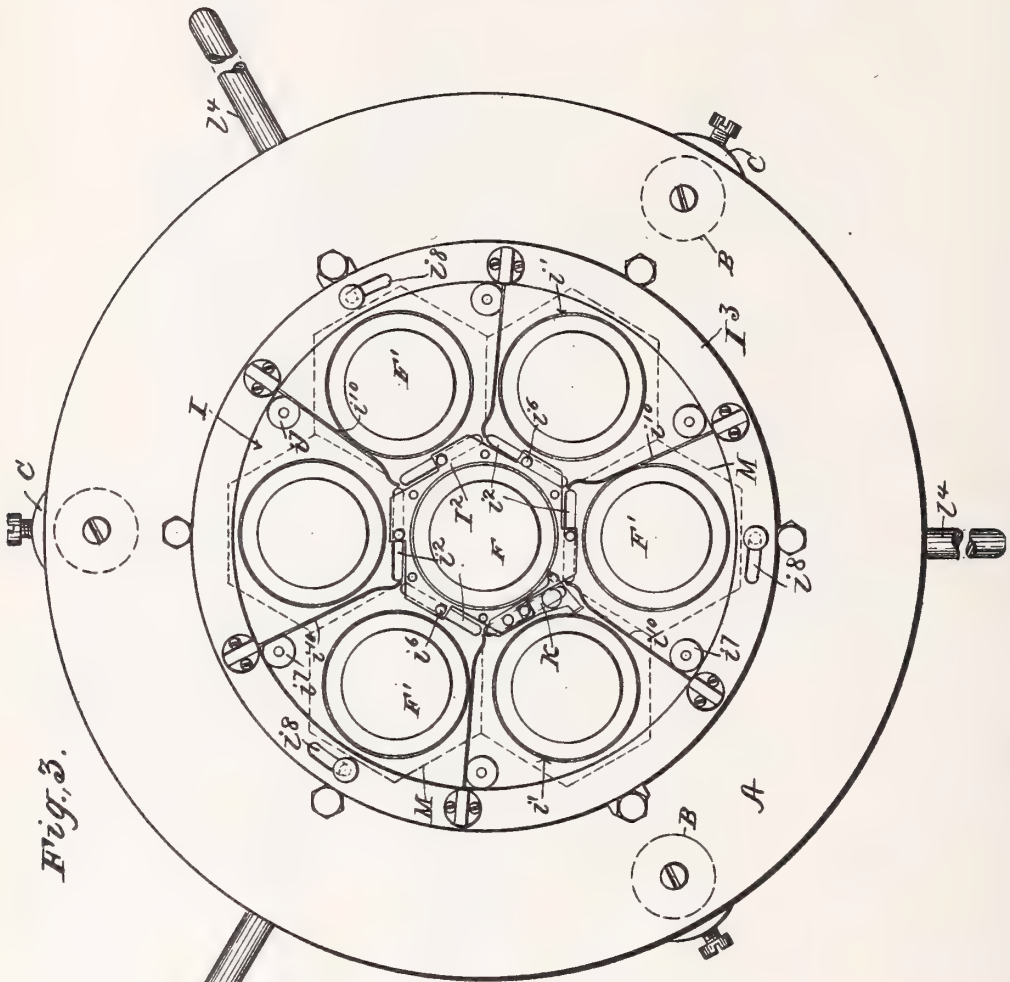


Fig. 3.

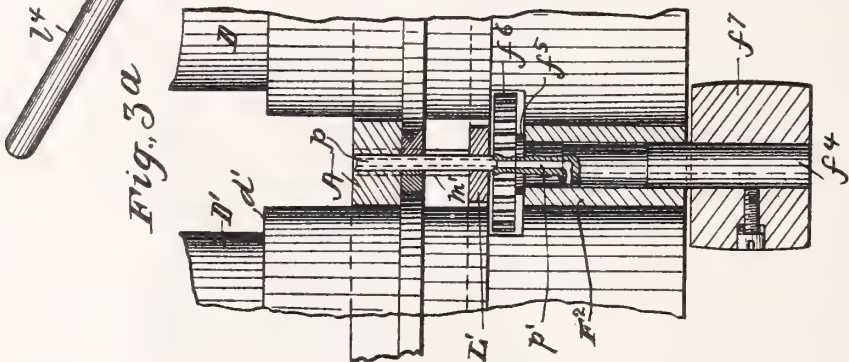


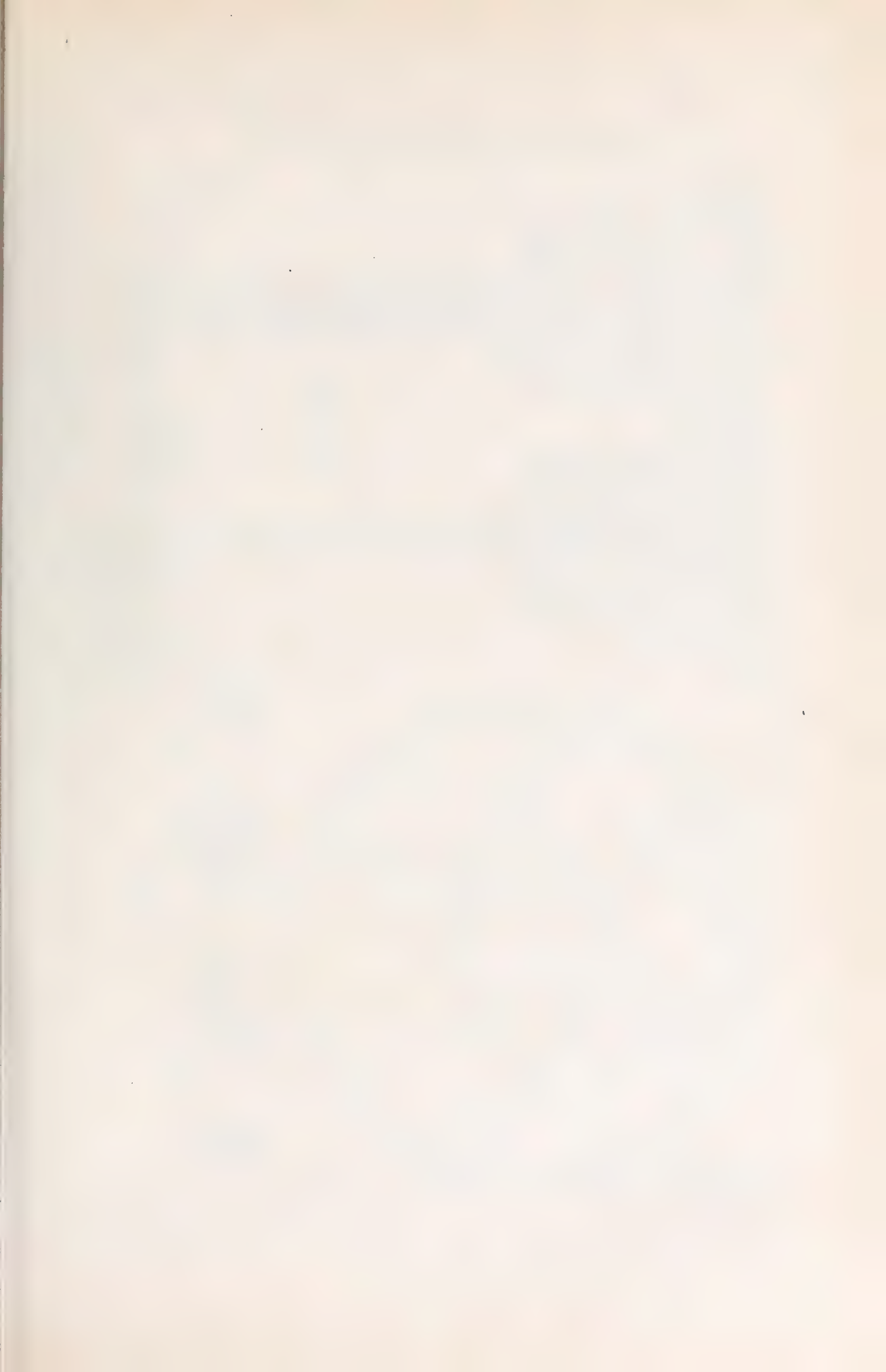
Fig. 3a

Witnesses
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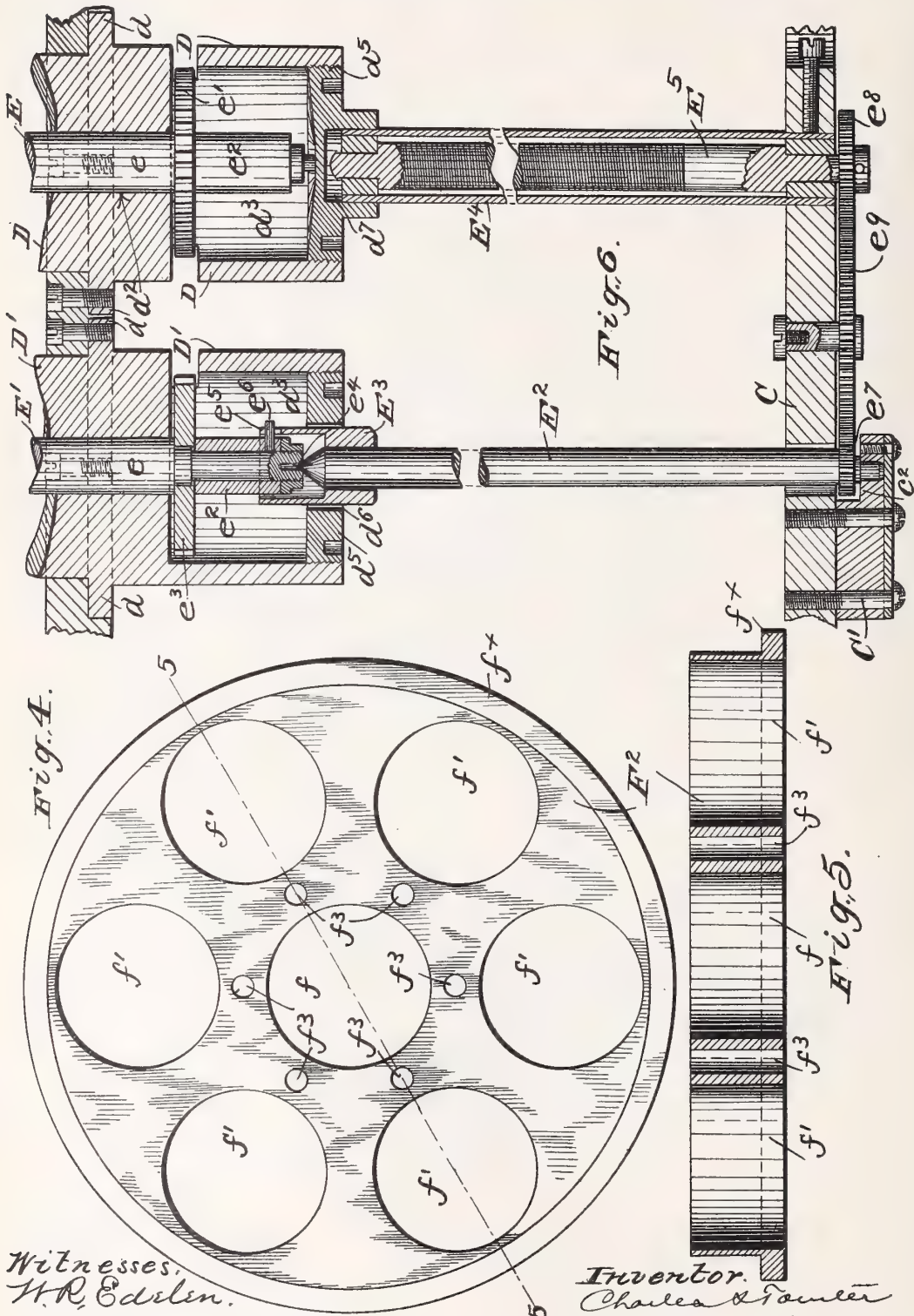


C. S. TAINTER.
GRAPHOPHONE RECORD DUPLICATING MACHINE.

(Application filed Aug. 16, 1898.)

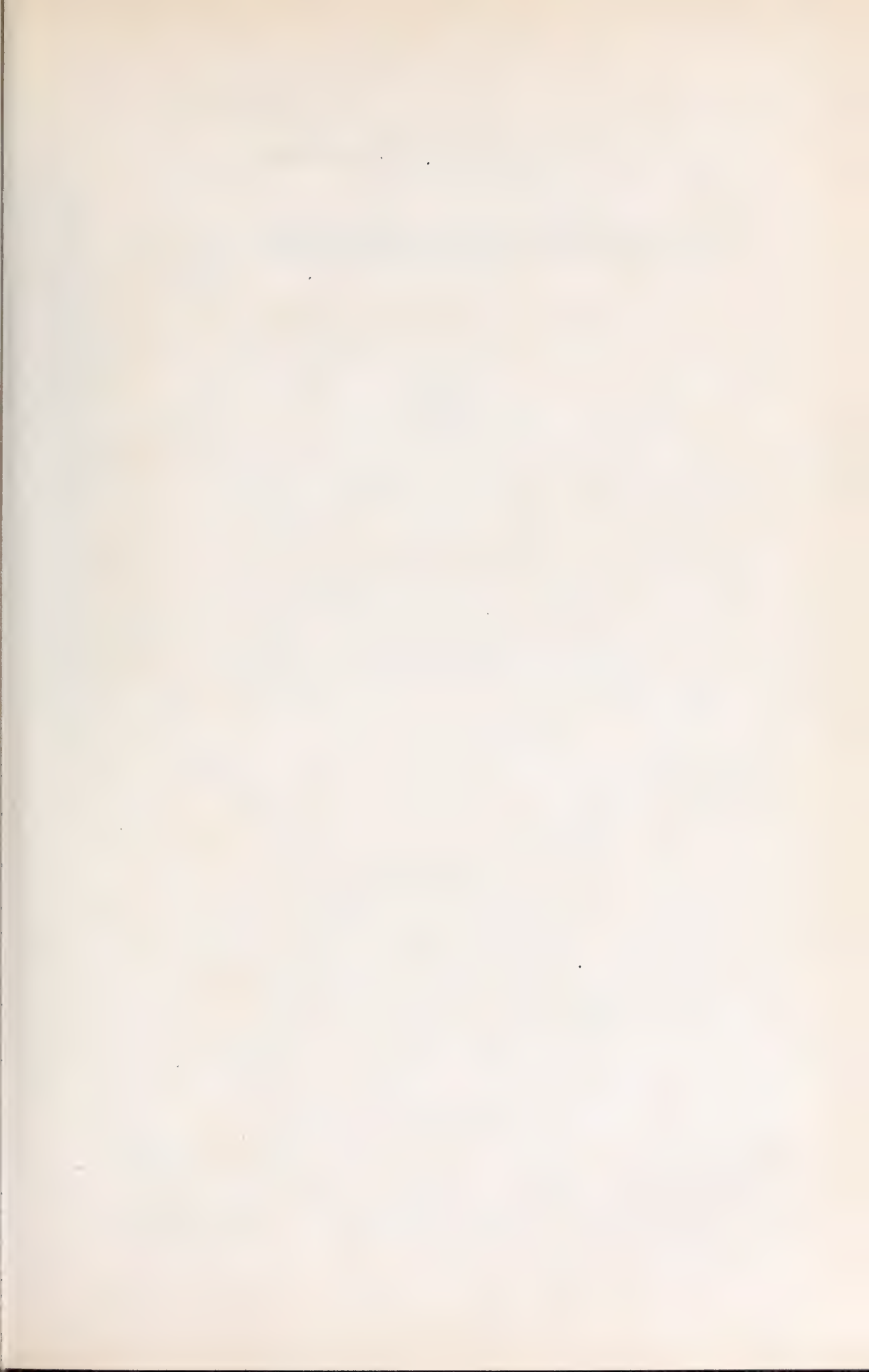
11 Sheets—Sheet 4.

(No Model.)



Witnesses.
H. R. Edelen.
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No. 670,442.

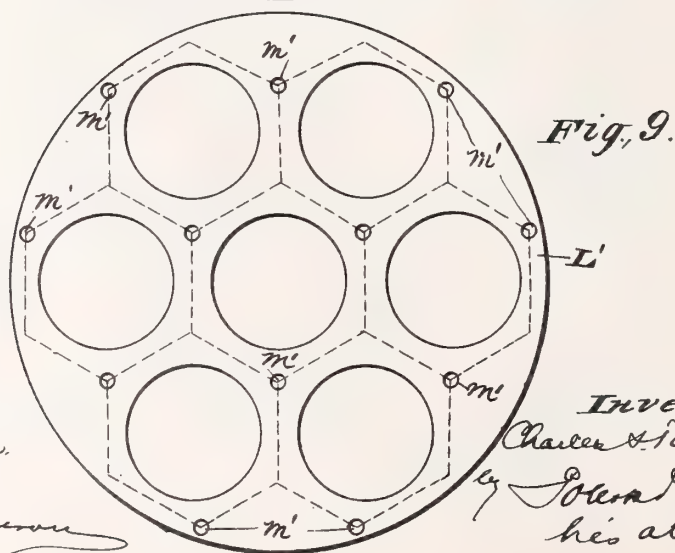
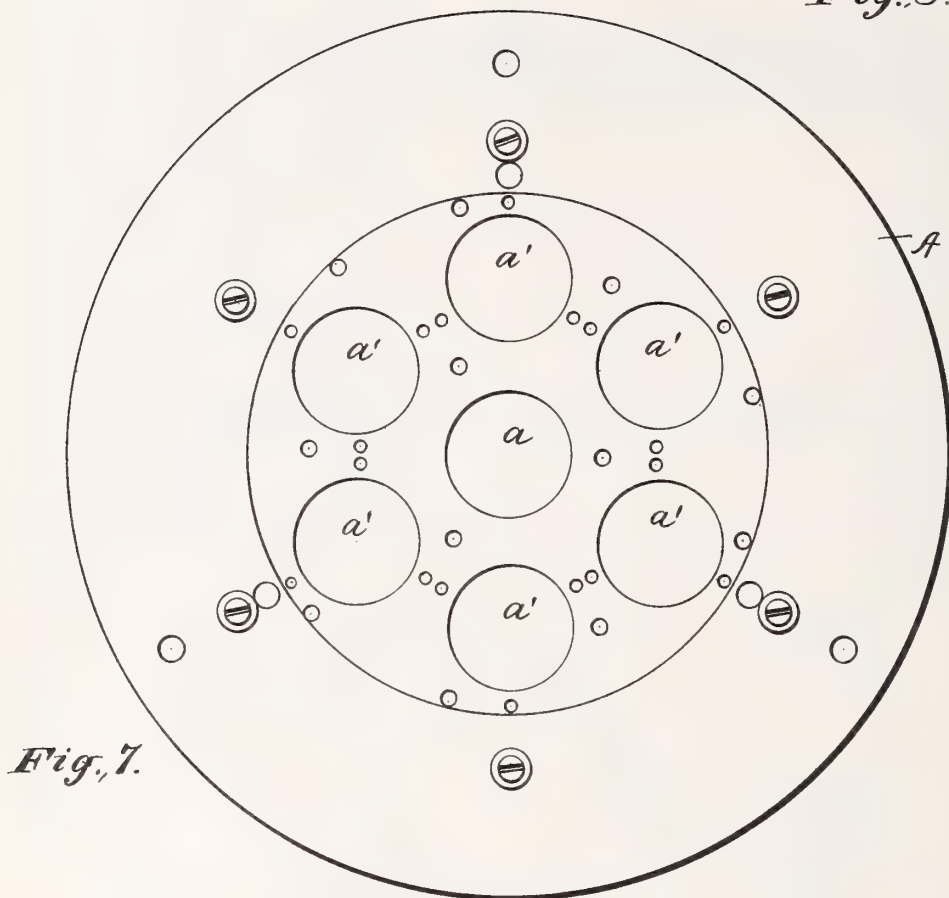
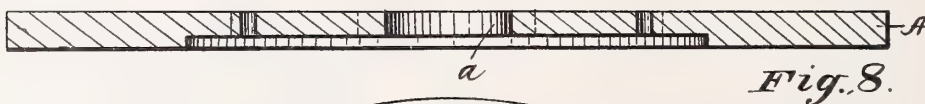
Patented Mar. 26, 1901.

C. S. TAITER.
GRAPHOPHONE RECORD DUPLICATING MACHINE.

(Application filed Aug. 16, 1898.)

(No Model.)

11 Sheets—Sheet 5.



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C. S. TAINTER.
GRAPHOPHONE RECORD DUPLICATING MACHINE.

(Application filed Aug. 16, 1896.)

(No Model.)

11 Sheets—Sheet 7.

Fig. 12

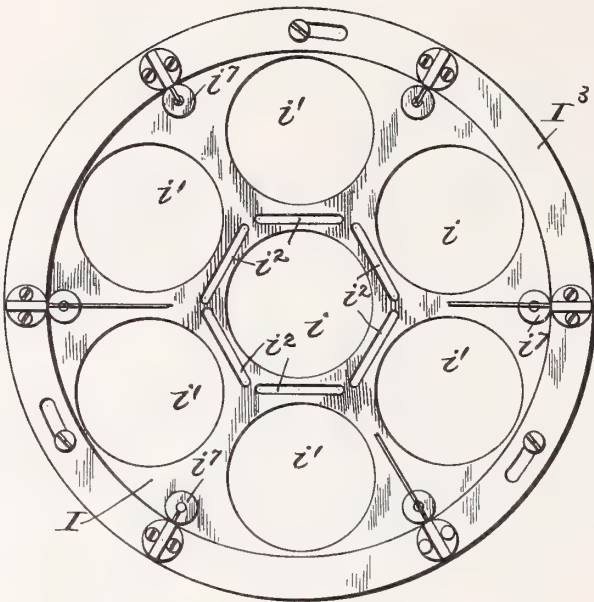


Fig. 13.

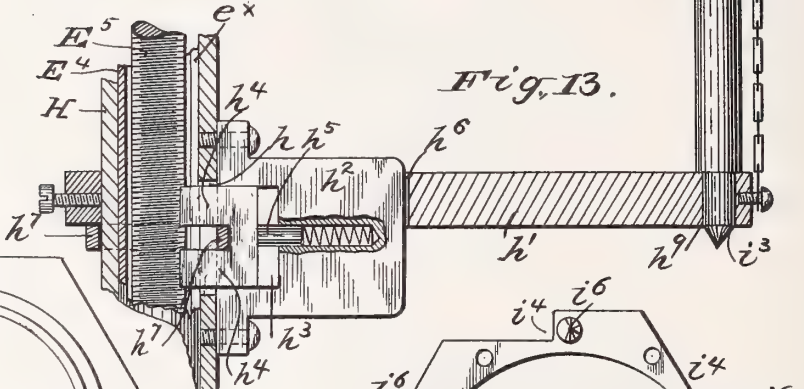


Fig. 14.

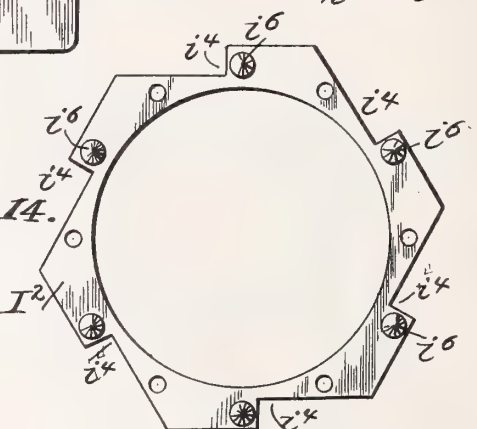
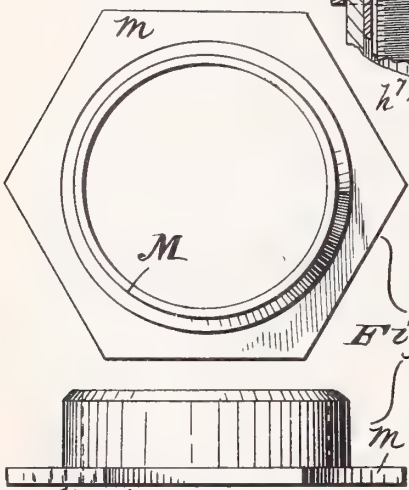


Fig. 15.



Witnesses.
H. R. Edelen.
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No. 670,442.

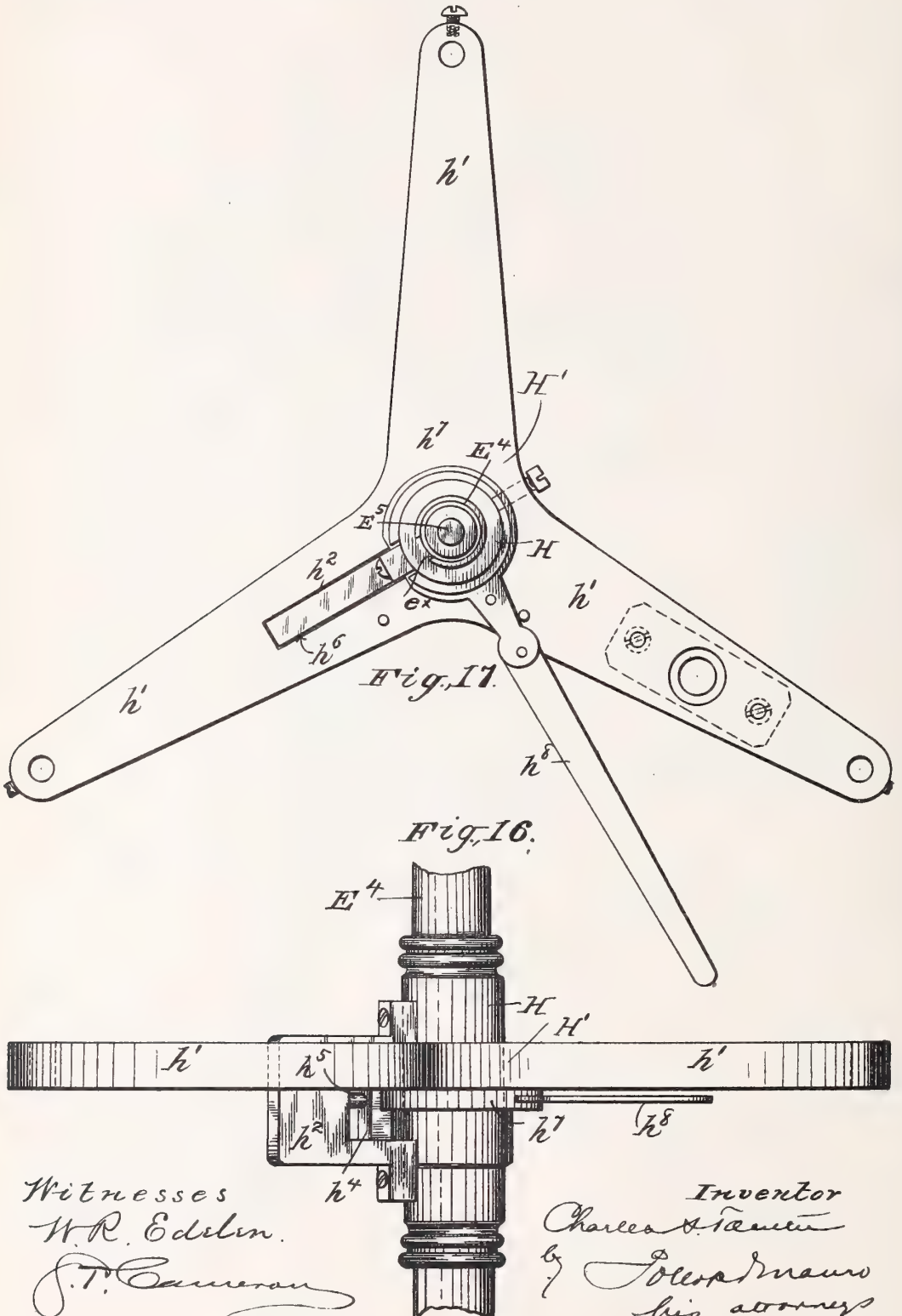
Patented Mar. 26, 1901.

C. S. TAINTER.
GRAPHOPHONE RECORD DUPLICATING MACHINE.

(No Model.)

(Application filed Aug. 16, 1898.)

11 Sheets—Sheet 8.



No. 670,442.

Patented Mar. 26, 1901.

C. S. TAITER.
GRAPHOPHONE RECORD DUPLICATING MACHINE.

(Application filed Aug. 16, 1898.)

(No Model.)

11 Sheets—Sheet 9.

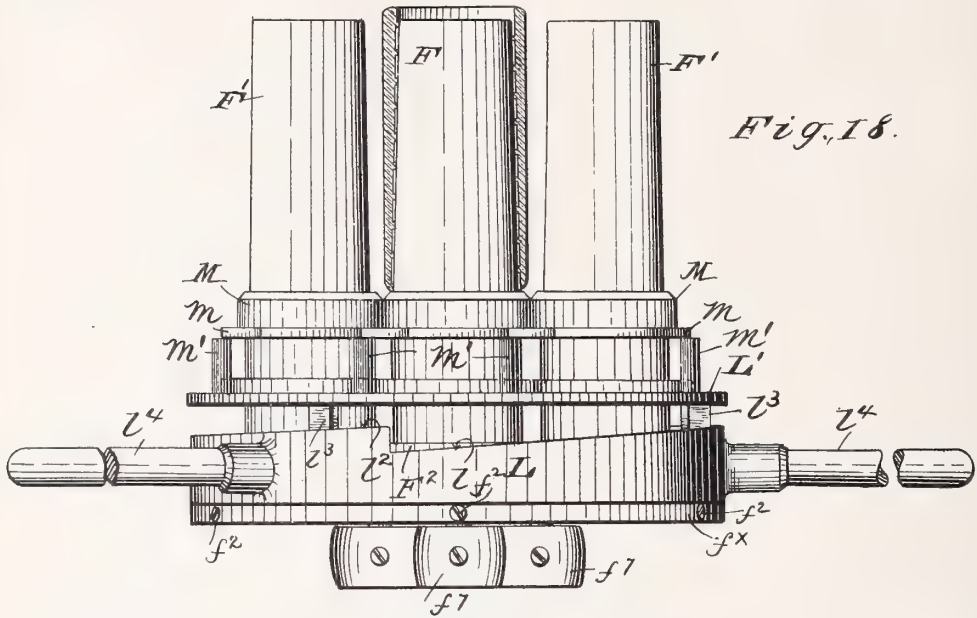


Fig. 18.

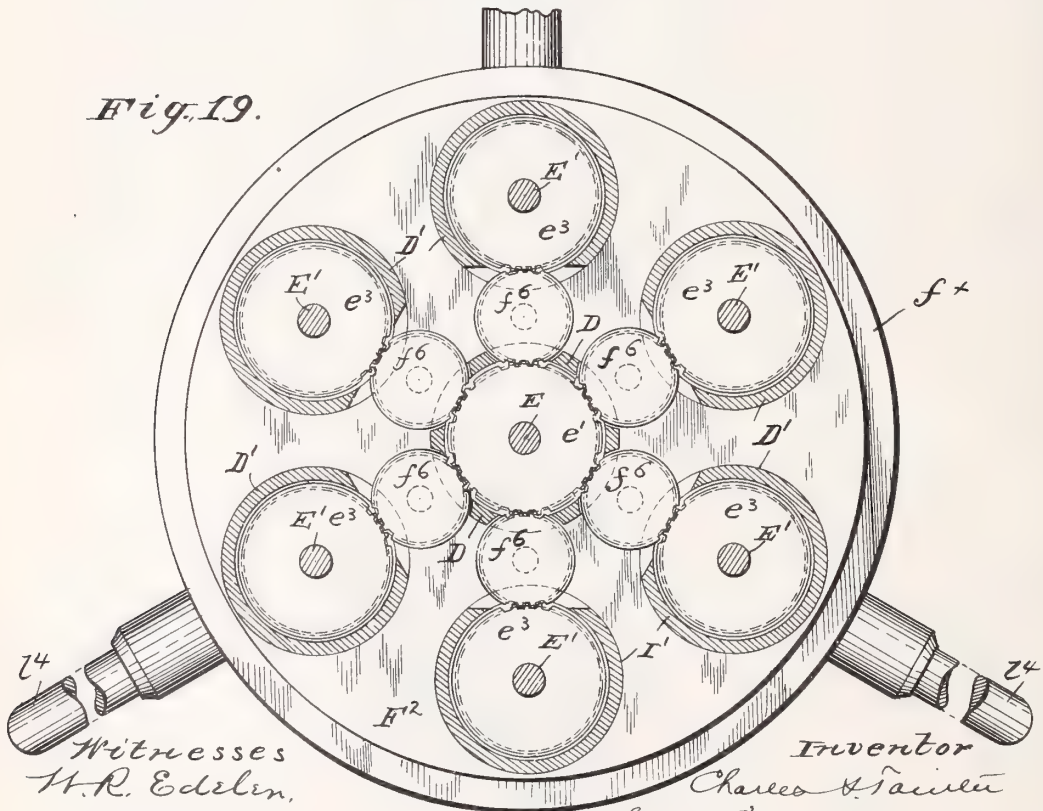


Fig. 19.

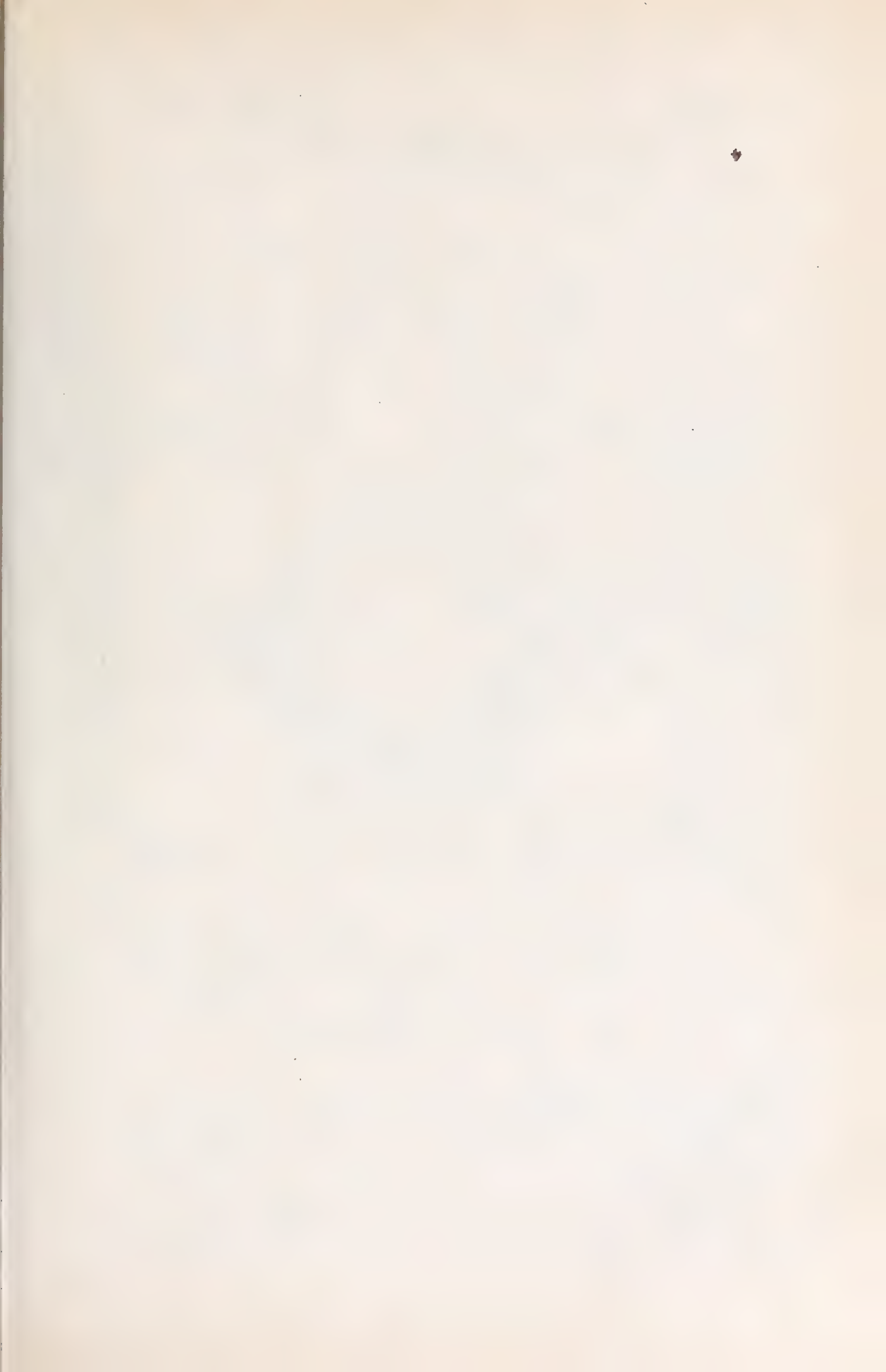
Witnesses
H. R. Edelen,

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No. 670,442.

Patented Mar. 26, 1901.

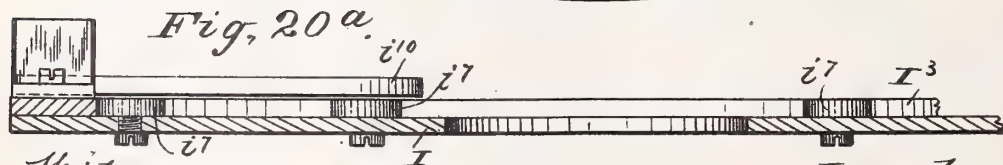
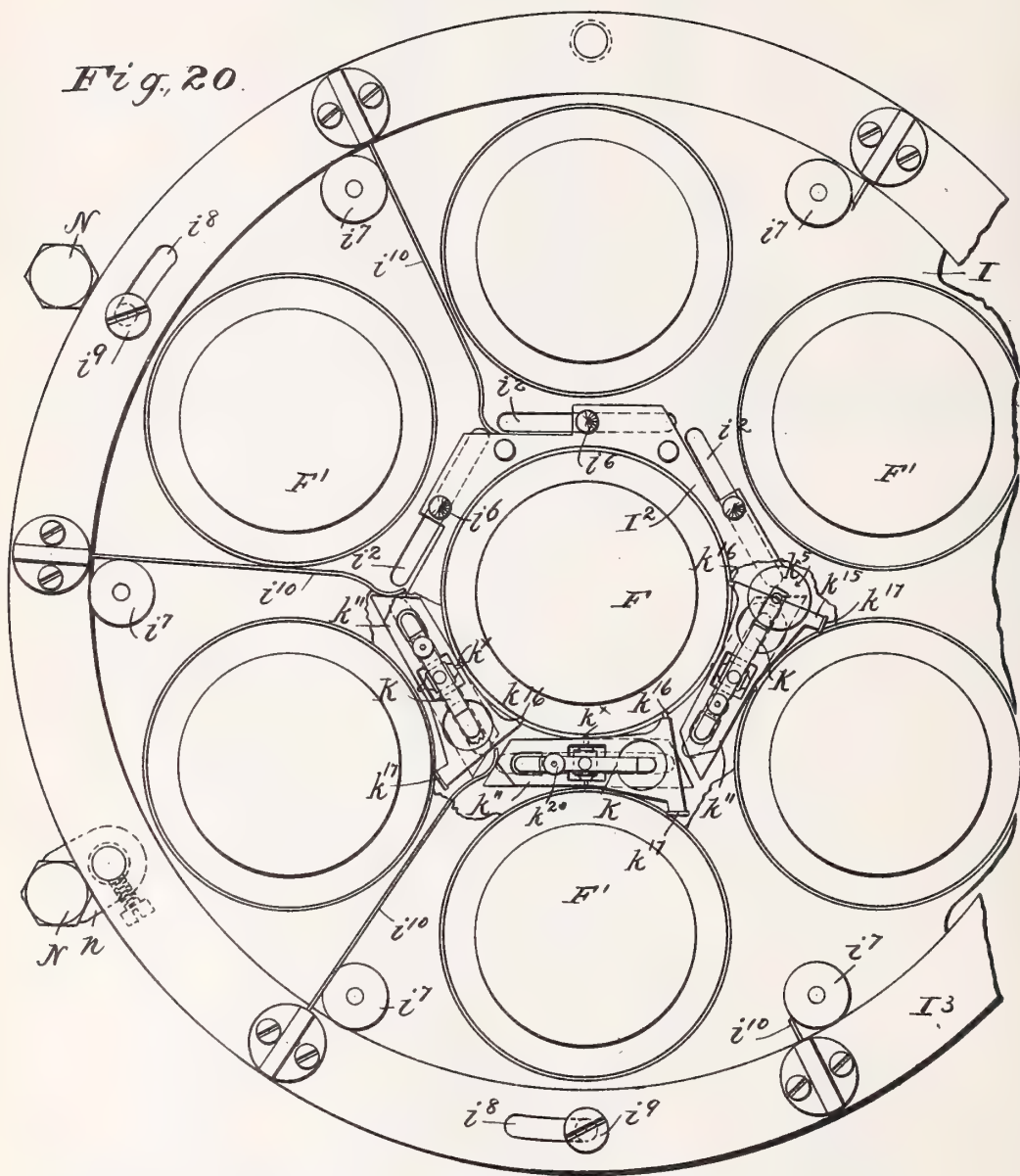
C. S. TAITER.

GRAPHOPHONE RECORD DUPLICATING MACHINE.

(Application filed Aug. 16, 1898.)

(No Model.)

11 Sheets—Sheet 10.



Witnesses.
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No. 670,442.

Patented Mar. 26, 1901.

C. S. TAINTER.
GRAPHOPHONE RECORD DUPLICATING MACHINE.

(Application filed Aug. 16, 1898.)

(No Model.)

11 Sheets—Sheet 11.

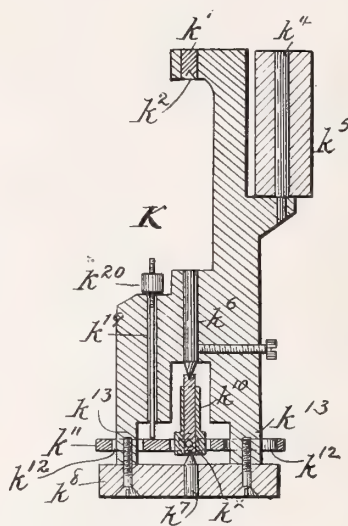
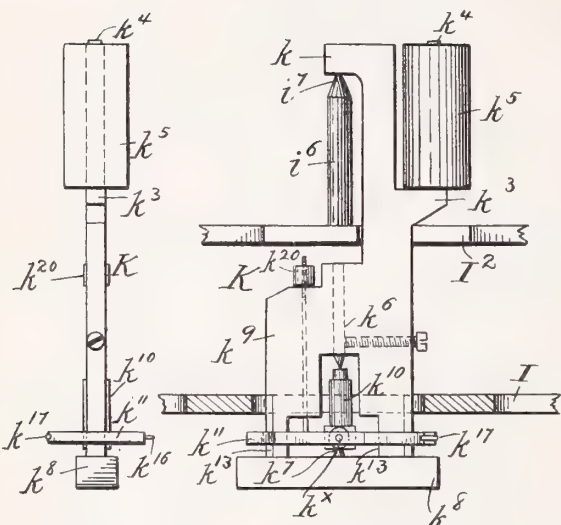
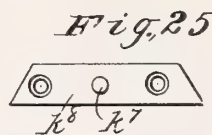
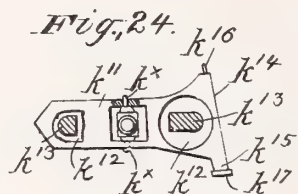


Fig. 22.

Fig. 21.

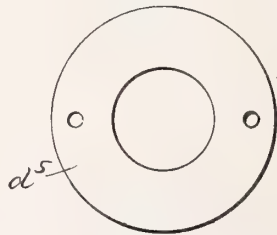
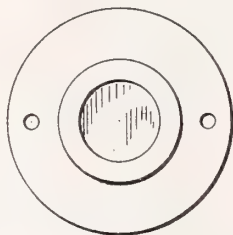
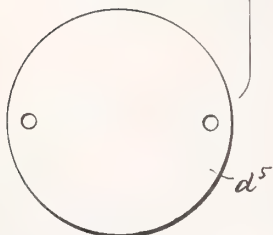
Fig. 23.



Fig. 26.

Fig. 27.

Fig. 28.



Witnesses
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by Pleasantman
his attorney

UNITED STATES PATENT OFFICE.

CHARLES SUMNER TAINTER, OF WASHINGTON, DISTRICT OF COLUMBIA,
ASSIGNOR TO THE AMERICAN GRAPHOPHONE COMPANY, OF SAME
PLACE.

GRAPHOPHONE-RECORD-DUPLICATING MACHINE.

SPECIFICATION forming part of Letters Patent No. 670,442, dated March 26, 1901.

Applicator filed August 16, 1898. Serial No. 688,717. (No model.)

To all whom it may concern:

Be it known that I, CHARLES SUMNER TAINTER, of Washington, District of Columbia, have invented a new and useful Improvement in Machines for Duplicating Graphophonic Sound-Records, which improvement is fully set forth in the following specification.

My invention relates to the art of duplicating sound-records for graphophones or talking-machines.

Most of the sound-records sold on the market at the present time are not the original sound-records formed by the vibrations of a cutting-style attached to a diaphragm upon which the sound-waves are caused to impinge, but are copies or "duplicates" of the records thus originally made by the direct action of the sound-waves. In the manufacture of such duplicates an original sound-record is first formed by causing the sound-waves to be recorded to impinge upon a vibrating diaphragm bearing a cutting-style whose point is embedded in the surface of a suitable recording-tablet. A record thus formed by the direct action of the sound-waves is known in the art as an "original" sound-record. This original record and a blank tablet are then mounted to revolve parallel to each other, and a follower with a fine blunt edge is caused to track in the record-groove and is connected by a suitable lever to a cutting-style whose point is embedded in the blank tablet. The blunt edge of the follower in the original sound-record rubs over the bottom of the undulatory groove constituting such record, and thus impresses upon the cutting-style whose point is embedded in the blank tablet vibrational movements exactly corresponding to the waves or undulations in the groove constituting the original sound-record, thereby causing the cutting-style to duplicate in the blank tablet the undulating groove of the original. There is thus produced a duplicate sound-record which is in every way as perfect a record of the original sound-waves as is the original sound-record itself and one which may be and is used to reproduce the original sound-waves in conjunction with a reproducer on a graphophone exactly as is

done with the original record. The duplicate may itself also be used as a master in the production of additional duplicates. This method of causing a sound-record, whether original or duplicate, to impress vibrational movements corresponding to the recorded sound-waves upon a cutting-tool or graver in contact with a record-tablet was patented to me in United States Patent No. 341,287, granted May 4, 1886, and an improved duplicating-machine operating in accordance with said method is shown in United States Patent to Macdonald, No. 559,806. Such machines are efficient in operation and produce accurate and satisfactory duplicate sound-records; but as they can make but one duplicate at a time it is necessary where a large number of duplicate records are to be made to employ a large number of duplicating-machines and workmen for operating the same.

The object of my present invention is to provide a duplicating-machine which shall be capable of simultaneously making a plurality of duplicate sound-records from a single master-record, thereby rendering it possible to largely increase the production of a factory over that obtained by the machines now in use and without any corresponding increase in the number of machines or in the operatives therefor.

To this end my invention, broadly stated, consists in means for simultaneously revolving a master-record and a plurality of blank tablets arranged in proximity thereto, each blank tablet having a cutting style or point embedded in its surface, which point is connected by a vibratory lever to a rubbing-style tracking in the record-groove of the master.

The invention further consists in mechanism for duplicating in a plurality of blank cylindrical tablets arranged in a vertical position a sound-record on or in a master-tablet, also operating in a vertical position, in which mechanism a series of rubbing-styles tracking in the record-groove of the master are connected to cutting-styles embedded in the blank tablets, the rubbing and cutting styles being yieldingly held in their proper operative positions by gravity or equivalent

spring action, whereby errors due to irregularities in the surfaces of the tablets are avoided.

The invention also consists in certain details of construction which will be hereinafter fully described and then pointed out in the claims.

I have illustrated one form which my invention may assume in the accompanying drawings, in which—

Figure 1 is a front elevation of my duplicating-machine, parts being removed. Fig. 2 is a vertical section, parts being in elevation. Fig. 3 is a top plan with some of the transferring-levers omitted. Fig. 3^a is a broken detail showing means for oiling the driving-pulley shafts. Fig. 4 is a top plan of the steadying-block. Fig. 5 is a vertical section on the line 5 5, Fig. 4. Fig. 6 is a vertical section showing the connections for driving the screw-shaft. Fig. 7 is a bottom view of the bed-plate. Fig. 8 is a vertical section thereof. Fig. 9 is a top plan showing the means for removing the tablets from the mandrels. Fig. 10 is a horizontal section on the line 10 10, Fig. 2, looking upward. Fig. 11 is a vertical section of one of the mandrel-supporting columns. Fig. 12 is a top plan of the carriage-plate. Fig. 13 is a sectional detail showing the means for actuating the carriage from the feed-screw. Fig. 14 is a plan of the support for the transferring-levers. Fig. 15 shows a plan and side elevation of a ring for removing tablets from the mandrels. Fig. 16 is a view of the spider which supports the carriage, showing its connection to the screw-shaft. Fig. 17 is a bottom view of the same. Fig. 18 is a side elevation showing the cam-ring and cooperating parts for removing tablets from the mandrels. Fig. 19 is a horizontal section on line 19 19, Fig. 2, looking downward. Fig. 20 is an enlarged top plan of the carriage, some of the transferring devices being shown in position and others being removed. Fig. 20^a is a partial vertical section thereof. Fig. 21 is a side elevation of the swinging block supporting the lever connecting the rubbing and cutting styles, which block, together with all the parts supported thereby, is for convenience of description herein referred to as a "transferring device." Fig. 22 is an edge view of Fig. 21, and Fig. 23 is a vertical section thereof. Fig. 24 is a plan view of the transferring-lever and the rubbing and cutting styles connected thereby. Fig. 25 is a plan of the bottom part of the swinging block, and Figs. 26, 27, and 28 are views in section and plan of bottom pieces for the columns hereinafter referred to.

Referring to the drawings, A is a bed-plate mounted upon hollow standards or supports B, the lower ends of which are properly spaced by a three-armed spider C, having openings *c* formed in the arms, through which openings the hollow standards B pass and in which they are secured by set-screws *c'*, as shown.

The bed-plate A has centrally formed there-through an opening *a*, and around this opening *a* are a plurality of similar openings *a'*. I have shown six such openings *a'*; but more or less than six may be employed, if desired, and while it is preferable to arrange these openings symmetrically around the central opening *a* this is not absolutely necessary. In the central opening *a* through the bed-plate is secured a vertical column D, and in each of the openings *a'* similar columns D' project both above and below the bed-plate and are secured in place by means of screws *a*², passing downward through the bed-plate and engaging circumferential flanges *d* upon the columns D D', which flanges fit an annular recess formed on the under side of the bed-plate A. The columns D D' are shouldered, as shown at *d'*, (see Fig. 11,) and have a central bore *d*², which bore is expanded below the bed-plate A into the circular chamber *d*³, having interior screw-threads *d*⁴ cut near the lower end thereof. This chamber *d*³ is closed by a bottom piece *d*⁵, Figs. 2 and 6, having its upper surface preferably somewhat dished, and upon this dished surface rests a shaft E of column D, which passes up through the bore *d*² in the column and has bearing-surfaces *e e* in contact with the surface of the bore, but is cut away between its ends to reduce friction.

On the upper projecting ends of the shaft E is secured a hollow mandrel F, which extends downward around the column, the mandrel preferably tapering slightly from its lower to its upper end and being at its open lower end nearly flush with the shoulder *d'*.

On the lower end of the shaft E is a gear *e'*, secured in place by the sleeve *e*², which is forced up against the gear *e'* by a binding-nut on the end of the shaft, as shown.

Each of the columns D' has a shaft E', to which is secured a mandrel F' on its upper end and a gear *e*³ on its lower end, the shafts E', mandrels F', and gears *e*³ being in every respect like the shaft E, mandrel F, and gear *e'* and all the shafts E' except one resting upon dished bottom pieces exactly similar to bottom piece *d*⁵ in column D. In the single case where the shaft E' is not supported by the dished bottom piece this piece has an opening *d*⁶ formed therein, through which a conically-pointed shaft E² projects, its conical point entering a centering depression *e*⁴ on the lower end of the shaft E'. (See Fig. 6.) The shafts E' and E² are coupled so as to turn together by a sleeve E³, which is connected to the shaft E², preferably by a driving fit of the parts, the other end of the sleeve fitting loosely over the nut and sleeve *e*² on the shaft E' and having an open-ended slot *e*⁵, into which projects a radial pin *e*⁶ on the sleeve *e*². This construction enables the parts to be readily assembled by driving the sleeve E³ onto the shaft E² and then slipping the sleeve and end of the shaft through the opening *d*⁶ in bottom piece *d*⁵, with the end of sleeve E³

surrounding sleeve e^2 and the pin e^6 entering the slot e^5 , while the conical point of the shaft E^2 enters the centering depression e^4 in the lower end of shaft E' . The shaft E^2 is passed through an opening in one arm of the spider C, its lower end resting in a bearing-block C' , secured to the under side of the spider. A recess c^2 is cut in the upper surface of the bearing-block, at the inner end thereof, and a pinion e^7 is secured on the end of shaft E^2 and revolves in the recess c^2 . The bottom piece closing the chamber d^3 of the central column D has a socket d^7 formed on the lower side thereof, and the upper end of a tube E^4 fits snugly in said socket and has its lower end secured by a set-screw in an opening at the center of the spider C. The tube E^4 has a slot e^x , Fig. 2, extending throughout its length, and in each end is secured a collar or ring affording bearings for a screw-threaded shaft E^5 , revolving within the slotted tube E^4 . On the reduced lower end of the screw-shaft E^5 , which projects below the spider C, is secured the pinion e^8 , which is geared through the idler e^9 to the pinion e^7 on the shaft E^2 .

Beneath the bed-plate A is a thick block F^2 , Figs. 4, 5, and 19, having openings f f' therein, which enable it to be slipped up over the ends of the columns D D' , which project below the bed-plate, the block F^2 being secured in place by means of set-screws f^2 , Fig. 2, passing inward from the perimeter of the block against the columns D' . The openings f f' in the block F^2 are formed with great exactness both as to size and position, as it is a part of their office to exactly center the columns D D' and hold them so as to avoid any vibration of the mandrels supporting the tablets and also to insure the perfectly-accurate working of the gearing connecting the several shafts E' with the central shaft E, Fig. 19, it being desirable to avoid any backlash or other play between the parts that would interfere with perfect uniformity in the operation of the seven mandrels.

Holes f^3 are formed in the block F^2 intermediate the center of the opening f and the several openings f' , and a shaft f^4 is inserted from above into each hole f^3 , shoulders f^5 on the shafts resting upon the upper surface of the block F^2 and supporting the shafts. Upon the projecting upper ends of the shafts f^4 are secured pinions f^6 , each of which intermeshes with and forms a driving connection between the gear e' in the shaft E and one of the respective gears e^3 on one of the shafts E' . (See Figs. 2, 3^a, and 19.) Each of the shafts f^4 projects below the block F^2 and carries a driving-pulley f^7 , suitably secured thereto. It will be understood that the six pulleys f^7 are thus symmetrically arranged around the central column D, and each is arranged to drive a shaft which is geared to the central shaft E and one of the shafts E' . The pulleys f^7 are surrounded by a closely-fitting band or belt G, Fig. 10, preferably of elastic material, and a

second belt G' passes around the band G and thence to any suitable source of power.

The operation of the device as thus far described is as follows: Power being applied to the belt G' it is communicated through the belt G to the pulleys f^7 , the latter belt serving to distribute the strain with great evenness, to the end that the gears f^6 may act with perfect uniformity, and since the central gear e' on the shaft E is connected to each of the equal gears e^3 on the shafts E' it follows that the central mandrel F and its surrounding six mandrels F' will all be smoothly and evenly driven at the same speed, and the shaft E^2 , being coupled to one of the shafts E' , turns with it and drives the screw-shaft E^5 through the gears on the end of said shafts and the idler e^9 , connecting them.

Surrounding the slotted tube E^4 is a sleeve H, Figs. 1, 2, 13, and 17, to which is adjustably attached a spider H' , having horizontally-extending arms h' . The sleeve H has a vertical slot h , Fig. 13, cut in one side, and opposite said slot h there is secured to the sleeve a block h^2 , having a recess h^3 cut therein, within which rests a pair of nut-sections h^4 , united at their outer extremities and having a spring-pressed pin h^5 , entering an extension of the recess h^3 . The block h^2 is located in a vertical slot h^6 , cut in one of the arms h' of the spider H' , and a cam-ring h^7 surrounds the sleeve H and passes between the nut-sections h^4 , a lever h^8 being provided for shifting the cam. The nut is held at all times against the cam-ring by the spring pressing on the pin h^5 , the nut-sections extending through the slot h in the sleeve H and the slot e^x in the tube E^4 . When the cam-ring is in the position shown in Fig. 13, the nut-sections engage the screw-shaft E^5 , revolving within the stationary tube E^4 , being held in engagement by the spring, thereby causing the sleeve H to advance longitudinally along the tube E^4 and carrying with it the spider H; but when the cam-ring is shifted it throws the nut out against the tension of the spring, and thereby disengages the nut from the shaft.

I, Figs. 2 and 12, is a circular plate having the central opening i and six marginal openings i' , each of which is of a size to slip freely over the tablets borne by the mandrels F F' . Six slots i^2 are cut in the plate, one between each of the openings i' and the central opening i , and form when thus arranged a regular hexagon around the opening i . The plate I is located above the bed-plate A and has attached to it three rods I' , forming legs, which pass down loosely through the bed-plate A, but outside of the block F^2 , and rest with their shouldered ends i^3 in sockets h^9 in the ends of the arms h' of the spider H' .

I^2 , Figs. 3, 14, and 20, is a hexagonal plate having its center removed, so as to form an opening corresponding to the central opening i in plate I, and having notches i^4 formed

in its periphery. This plate I^2 is supported on pillars i^5 , (preferably six in number,) attached to the upper side of the plate I, and bears six upwardly-projecting pointed standards i^6 , each of which is secured thereto near one end of a notch i^4 , as shown in Fig. 14. The sleeve H, spider H' , plates I and I^2 , together with their connecting parts, constitute a vertically-moving carriage, and this carriage, with the parts supported thereby, is counterbalanced by weights b , attached to cords or chains b' , passing over pulleys b^2 .

Passing upward through each of the slots i^2 in the plate I is a block K, Figs. 1, 20, and 21, hung to swing on the pointed standards i^6 . There are six of such blocks K, and as they are all identical in construction a description of one will suffice for all. On the upper end of the block is a horizontally-projecting arm k , in which is secured a piece of hardened steel k' , with a depression k^2 , forming a bearing-surface for the tempered point i^7 of the standard i^6 . Extending from the side of the block opposite the bearing-arm k is a lug k^3 , on which is a pin k^4 , and k^5 is a weight or weights having a bore therethrough in order that it may be slipped on over the pin k^4 . A vertically-adjustable bearing-point k^6 (preferably of hardened steel) is secured in a lower arm k^9 of the block K, which arm projects horizontally beneath the plate I^2 . Between the bearing-point k^6 and a similar point k^7 on a bottom piece k^8 , attached to the block K, is a block or hub k^{10} , which turns freely on a substantially vertical axis. The lower arm k^9 of the block K is cut away, as shown, so that the hub k^{10} turns in a recess thus formed and supports a lever k^{11} , which is hung on a horizontal axis to the hub k^{10} . The lever k^{11} has openings k^{12} near its opposite ends, through which legs k^{13} on the block K freely pass, so that the lever k^{11} may turn to a limited extent on its horizontal axis k^x or with the block k^{10} on its vertical axis. That end of the lever k^{11} which extends out under the weight k^5 is broadened into projecting points or arms k^{14} and k^{15} . A rubbing-style k^{16} is secured in the arm k^{14} , and a cutting-style k^{17} is fastened to the arm k^{15} , as clearly shown in Figs. 20 and 24, that end of the lever k^{11} supporting the styles being slightly heavier than the opposite end, so that if left free to turn about its horizontal axis the style-bearing end of the lever k^{11} would be depressed. A pin k^{19} fits loosely in the arm k^9 and has a small weight k^{20} on its upper screw-threaded end, the pin k^{19} extending down through the arm k^9 and bearing on that end of the lever k^{11} opposite the styles. The mass of the weight k^{20} is sufficient to overbalance the lever k^{11} ; but by adjusting the weight k^{20} on the pin k^{19} it may be caused to bear upon that end of the lever k^{11} opposite the styles until the lever becomes horizontal, at which point the weight k^{20} is taken by the upper face of the arm k^9 of the block K. By this means the lever k^{11} is held yieldingly in a hori-

zontal position, while the end bearing the rubbing and cutting styles is left free to move so as to accurately follow the record-groove in the master-record or respond to inequalities in the tablets.

Referring now to Fig. 20, the lever k^{11} is so proportioned and the rubbing and cutting styles so positioned thereon that the styles each come in contact with their respective tablets at the point where a line drawn through the vertical axis of the lever k^{11} is tangent to the tablet, the result being that the vibrations of both the rubbing and the cutting styles are substantially on radial lines of their respective cylinders, which is the direction along which said vibrations should occur for the production of the best results. By reason of the pendulum-like action of the block K the styles automatically find their proper position and are held to their work by the weight k^5 , the mass of which is adjusted to a nicety to the end that it may yield sufficiently to allow the styles to conform to irregularities in the contour of the tablets and at the same time effectively prevent the styles from leaving the surfaces of the tablets. By thus mounting the style supporting and controlling lever so that it is free to turn about a universal joint and holding it to its work by the action of gravity I give to it all the sensitiveness and accuracy, when acting in conjunction with vertically-disposed tablets, that the well-known "floating" or "gravity" recorders and reproducers of the graphophone possess when acting to record or reproduce a record on a horizontally-disposed tablet.

In action the carriage bearing the rubbing and cutting styles, as described, is placed in its lowermost position and is elevated by the feed-screw E^5 at the same time that the mandrels are revolved. The result is that the records are cut in a spiral line starting at the bottom and ending at the top, so that when the records are completed the carriage, with its transferring-blocks and their supported styles, is at the top. In order to remove the records, it is necessary that the carriage be depressed, and before this is done it is essential that the styles be shifted so that they will not come in contact with the records during the downward movement of the carriage. For this purpose a ring I^3 is mounted on the plate I and is preferably of equal diameter therewith. This ring I^3 bears with its inner circumference on loosely-turning rollers i^7 , secured to the plate I in position to center the ring I^3 thereon. Slots i^8 are cut in the ring I^3 , and screw-pins i^9 are passed therethrough into the plate I, so that the ring I^3 has a limited circular movement upon the plate I. Secured to the ring I^3 are six spring-arms i^{10} , extending inward from the ring to the pendulous blocks K. When the styles are in operation, the inner ends of the arms i^{10} are adjacent to but not quite in contact with that edge of the respective blocks K which is opposite to the styles, (see Figs. 3 and 20,) and by shifting the ring

I^3 from left to right the spring-arms will simultaneously strike upon and swing the pendulous blocks K to the right, and thus throw all the rubbing and cutting styles out of contact with their respective tablets. The lower ends of the blocks K are shaped as shown in Fig. 25, and when the blocks are hanging in operative position said lower ends together form a nearly-closed regular hexagon; but as the movements of the blocks under the action of the spring-arms are simultaneous they do not in the swinging movement above described interfere with each other. The blocks being swung aside, the carriage may be lowered without danger of injury to the records from the styles, and the records being removed and new tablets placed on the mandrels the styles may be returned to their active positions by shifting the ring I^3 from right to left, the weights h^5 promptly throwing the styles in contact with their respective tablets.

In order that the tablets may be readily removed from the mandrels, I provide a means whereby they may be raised and, because of the slightly-conical form of the mandrels, loosened, thereby placing them where they may be readily grasped by the fingers and lifted from the machine. I provide the block F^2 with a flange f^x , and resting upon this flange and turning freely around the block is a cam-ring L, having formed in its upper edge cam-surfaces l . There are three such cam-surfaces shown, each extending from its lowermost point to the top of the ring L, where they run into flat surfaces l^2 . Normally resting upon said flat surfaces is a plate L' , having lugs l^3 on its under side and resting in the cams l . The plate L' is perforated to allow the lower tubular portions of the columns D D' to pass therethrough, but is otherwise a solid plate. (See Fig. 9.) Any suitable handle h^4 is attached to the cam-ring, whereby it may be given about a one-third revolution, which causes the lugs l^3 to travel up the inclines or cams l and rest upon the flat surface at the top of the cam-ring, thereby raising the plate L' through a distance equal to the rise of the cams l . Surrounding the base of each one of the columns D D' and resting on the bed-plate A is a ring or collar M, Fig. 1, dotted lines, and Figs. 2, 3, 15, and 18, whose internal diameter but slightly exceeds the external diameter of the mandrel on the columns, as clearly shown in Fig. 2. This ring M has a horizontally-extending base or flange m , in the form of a regular hexagon, so proportioned that when the several rings M are in place around the columns D D' the hexagonal flanges m meet and form, in effect, a complete and continuous flooring over all the space on the bed-plate between and around the columns, as is clearly indicated in dotted lines, Fig. 3. If desired, the flanges of the several rings might be united into one integral plate and the rings made separate therefrom and allowed to rest loosely thereon.

Passing loosely through the bed-plate A

and resting upon the plate L are a number of pins m' , whose length is just sufficient to reach from the top of the plate L when in its lowermost position to the top of the bed-plate A. These pins m' are clearly shown in Fig. 18, where the bed-plate A is omitted for the purpose of more clearly illustrating their operation and their relative distribution, whereby when the pins m' are raised above the bed-plate, as hereinafter described, they will press equally against all the flanges m of the rings M, and thereby lift them evenly and smoothly from the bed-plate, as shown in Fig. 9. Referring now to Figs. 1, 2, and 18 and assuming the parts to be in the position shown in Fig. 2, with tablets on the mandrels and the cam-ring L shifted to the right, with the plate L' resting upon the flat surfaces l^2 and the lugs l^3 in the lowermost parts of the cams l , it will be seen that the upper edges of the rings M are immediately beneath the lower ends of the mandrels and that the pins m' rest upon the plate L' , with their ends flush with the top of the bed-plate A. If now one of the handles h^4 be grasped and the cam-ring L be shifted to the left, the lugs l^3 will ride up the inclines or cams l , forcing up the plate L' , which in turn raises the pins m' , and through them the flanged rings M, which latter engage the lower ends of the tablets and force them upward. The mandrels are slightly tapering toward the top, and the upward movement of the tablets so loosens them that they may be readily removed. When the cam-ring is given its full throw to the left, it will have turned through nearly one-third of a revolution, and the lugs l^3 will then rest upon the flat surfaces l^2 at the top of the cam-ring, thereby securely retaining all the parts in their elevated position while the tablets are being renewed, after which the cam-ring is again shifted to the right preparatory to placing other tablets upon the mandrels.

The carriage supporting the pendulous levers K is guided in its up-and-down movements by ears or lugs n , embracing uprights N, firmly secured on the bed-plate A, and the weights b in the hollow standards B are so proportioned that their combined mass is just sufficient to counterbalance the carriage, with all its supported parts, to the end that the work of the screw E in elevating the carriage may be reduced to the minimum. A further result of this construction is that the carriage will remain stationary in any position in which it may be placed.

The parts of the mechanism needing lubricating are very few, and I have provided means whereby lubrication may be readily accomplished. Referring to Fig. 2, d^7 is a small hole in column D, extending inward from the surface of the column under the ring M and then downward till it enters the chamber d^3 , just inside the wall of the chamber. Oil entering this hole 27 at the top passes down into the chamber d^3 and along the walls thereof to dished bottom d^5 , where it acts to

lubricate the bearing of the shaft E on said bottom. A similar means is provided for oiling all the shafts E', except the one shown to the left of Fig. 2, where it is omitted, because in that instance the shaft does not rest upon the dished bottom piece that passes there-through. The lower bearing *e* of the shafts E E' is lubricated through a hole *d*⁸ in a manner that will be readily understood.

In order to lubricate the shaft *f*⁴ of the driving-pulleys *f*⁷, I pass a small tube *p* down through the bed-plate A, which tube registers with a longitudinal bore *p*', extending from the top of the shaft *f*⁴ downward in a vertical direction for a short distance and then outward to the periphery of the shaft. By lifting the rings M the tube *p* may be filled with oil, which will slowly find its way through the bore *p*' to the bearings of the shaft *f*⁴.

I have shown at T, Fig. 10, a means for tightening the belt G, which will be readily understood.

It will be understood that while I have specifically and in detail described the best form known to me which my invention may assume, I have done so only that the invention might be thoroughly understood and not as indicating that the invention is limited to the specific construction shown, as the generic inventive idea may be embodied in different specific mechanical forms, and all such are meant to be included by the terms of my claims.

Having thus described my invention, I claim—

1. In a machine for duplicating sound-records the combination, with a tablet having a record formed therein and a plurality of tablets for receiving records, of a plurality of followers rubbing over the record, and a plurality of cutters each of which is movable with one of the followers, and each of which is embedded in the surface of one of the blank tablets, and mechanism for revolving the tablets and causing the followers to simultaneously follow the record and the cutters to simultaneously trace a spiral line upon the blank tablets, whereby a plurality of duplicate sound-records may be simultaneously formed from a single master-record, substantially as described.

2. In a machine for duplicating sound-records the combination of a revolving tablet having a sound-record therein, with a plurality of revolving blank tablets, a plurality of followers rubbing over the record, a plurality of cutters each of which is movable with one of the followers and each of which is also embedded in the surface of one of the blank tablets, gravity-controlled devices yieldingly holding the followers and cutters in contact with the respective tablets, and mechanism for revolving the tablets and causing the followers to simultaneously follow the record and the cutters to simultaneously trace a spiral line upon the blank tablets, whereby a plurality of duplicate sound-records may

be simultaneously formed from a single master-record, substantially as described.

3. In a machine for duplicating sound-records, the combination of a plurality of vertically-disposed revolving mandrels, one of which bears a tablet having a sound-record formed therein and the others bearing blank tablets with a cutter embedded in the surface of each blank tablet, and a corresponding number of followers simultaneously rubbing over the record of the record-tablet, the cutters being mounted to partake of all the movements of the followers, substantially as described.

4. In a machine for duplicating sound-records the combination of a plurality of vertically-disposed revolving mandrels, one of which bears a tablet having a sound-record formed therein and the others bearing blank tablets, with a cutter embedded in the surface of each blank tablet, a corresponding number of followers simultaneously rubbing over the record of the recording-tablet, the cutters being mounted to partake of all the movements of the followers, and gravity-controlled devices yieldingly holding the followers and cutters in contact with the respective tablets.

5. The combination with a sound-record formed in a vertically-disposed tablet, of a vertically-disposed blank tablet, a gravity-controlled follower rubbing over the sound-record, a cutter embedded in the surface of the blank tablet and movable with the follower, and means for revolving the tablets and causing relative longitudinal movement between the tablets on the one hand and the cutter and follower on the other hand, substantially as described.

6. In a machine for duplicating sound-records, the combination of a vertically-disposed revolving master-record, and a plurality of vertically-disposed revolving blank tablets, with a plurality of followers, a plurality of cutters each one of which is movable with one of the followers, and gravity-controlled devices holding the followers and cutters, yieldingly in contact with the master-record and blank tablets respectively, substantially as described.

7. In a machine for duplicating sound-records the combination of a vertically-disposed mandrel bearing a master-record, a plurality of vertically-disposed mandrels each bearing a blank tablet and each independently geared to the mandrel bearing the master-record, with a vertically-moving carriage bearing a plurality of followers and a like number of cutters each of which is movable with one of the followers, and a plurality of gravity-controlled devices each of which holds a single follower and its coacting cutter yieldingly in contact with the master-record and with one of the blank tablets respectively, substantially as described.

8. In a machine for duplicating sound-records, a master-record, a plurality of blank tab-

lets, and a plurality of pendulous levers, each lever supporting a follower in contact with the record and a cutter in contact with one of the blank tablets, whereby a plurality of
 5 duplicate sound-records may be simultaneously formed from a single master-record, substantially as described.

9. In a machine for duplicating sound-records a master-record, a plurality of blank tablets, a plurality of pendulous levers, each lever supporting a follower in contact with the record and a cutter in contact with one of the blank tablets, and means for simultaneously throwing all the followers and cutters out of
 10 contact with the record and tablets, substantially as described.

10. In a machine for duplicating sound-records, a vertically-disposed master-record, a plurality of blank tablets, a plurality of pendulous levers, each lever supporting a follower in contact with the record and a cutter in contact with one of the blank tablets, and a vertically-movable carriage supporting said pendulous levers, substantially as described.

11. In a machine for duplicating sound-records, a central, vertically-disposed mandrel, a plurality of mandrels surrounding said central mandrel and each geared thereto, combined with a screw-shaft, a vertically-movable carriage, a lever supported upon said carriage and capable of movement about a universal joint, a follower and a cutter each attached to said lever, and nut-sections connecting said carriage to said screw-shaft, substantially as described.

12. In a machine for duplicating sound-records, a vertically-disposed mandrel carrying a sound-record, a plurality of vertically-disposed mandrels each having a blank tablet, a vertically-movable, counterpoised carriage supporting a plurality of followers in contact with the record, a plurality of cutters each movable with a follower and each in contact with a blank tablet, and means for revolving all the mandrels and giving translatory motion to the carriage, substantially as described.

13. In a machine for duplicating sound-records, a vertically-disposed pendulous lever, a follower connected by a universal joint thereto, and a cutter movable with said follower, substantially as described.

14. In a machine for duplicating sound-records, a pendulous lever, a block attached

thereto and turning on a vertical axis, a lever supported by said block to turn on a horizontal axis, and a follower and cutter connected to said last-mentioned lever, substantially as described.

15. In a machine for duplicating sound-records, a bed-plate, suitable supports therefor, vertically-disposed columns mounted in openings so as to project above and below said bed-plate, shafts taking bearing in said columns and projecting therefrom above and below, mandrels secured to the upper ends of said shafts and gears to the lower ends thereof, and means connecting all the gears to a common source of power, whereby the mandrels are all simultaneously revolved, substantially as described.

16. The combination of a plurality of shaft-supporting columns mounted on a bed-plate with a centering and steadying block supported by said columns, substantially as described.

17. The combination of a plurality of mandrels for carrying record-tablets, a series of rings or collars capable of longitudinal movement along said mandrels, a cam-ring, and devices interposed between the same and said rings or collars, whereby the turning of the cam-ring will produce the longitudinal movement of the rings or collars, substantially as described.

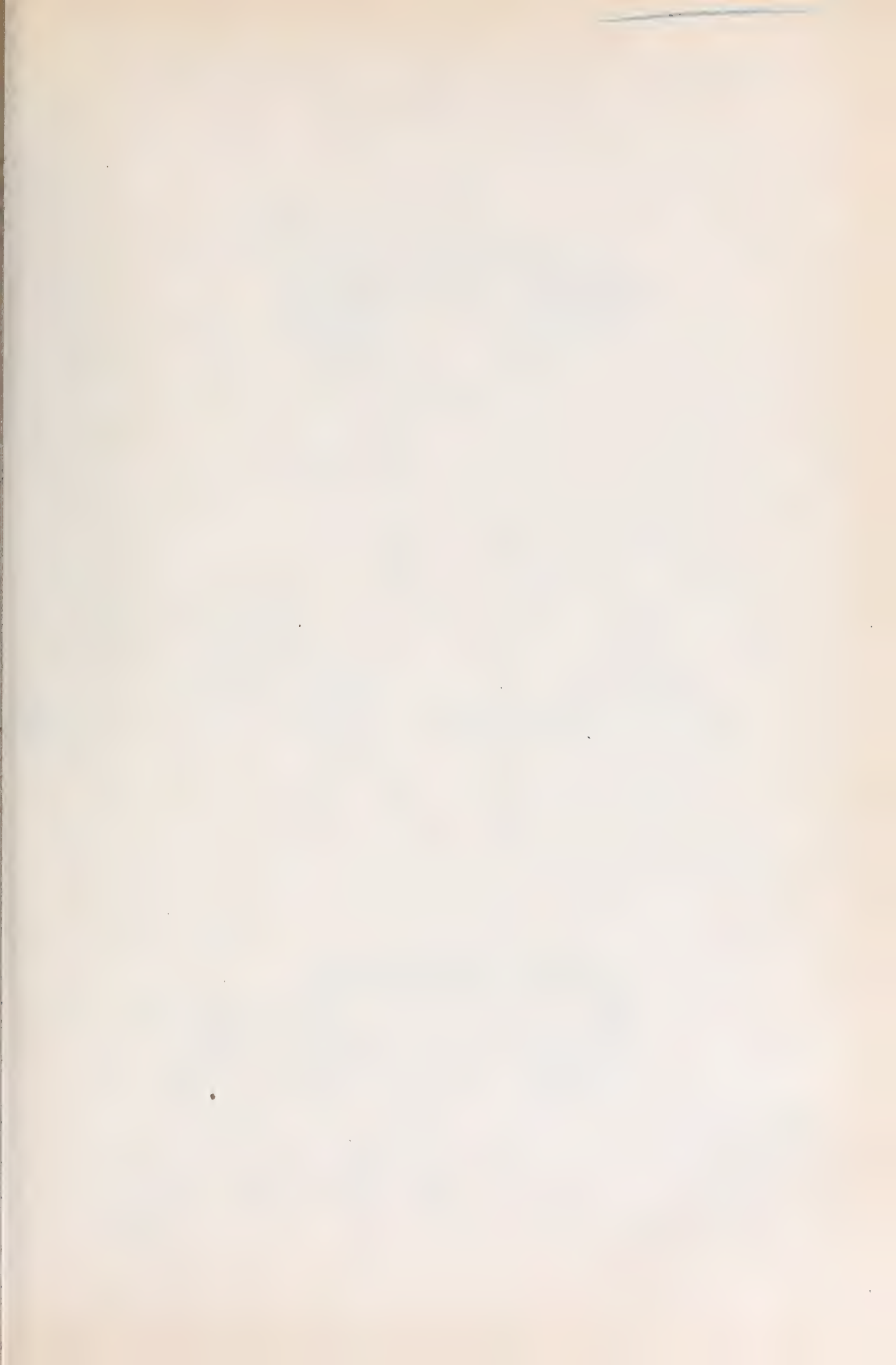
18. In a machine for duplicating sound-records, a plurality of mandrels supporting a sound-record and a plurality of blank tablets, a plurality of pendulous levers supporting a plurality of followers in contact with the sound-record and a plurality of cutters one in contact with each blank tablet, a plurality of arms one in proximity to each pendulous lever, and an adjustable support common to all the arms, whereby said arms may be thrown into contact with the pendulous levers and swing the same so as to carry the followers and cutters out of contact with the record and blank tablets, substantially as described.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

CHARLES SUMNER TAINTER.

Witnesses:

E. T. ROCKWOOD,
 WM. R. MILLER.



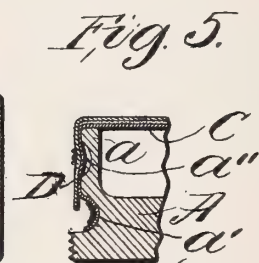
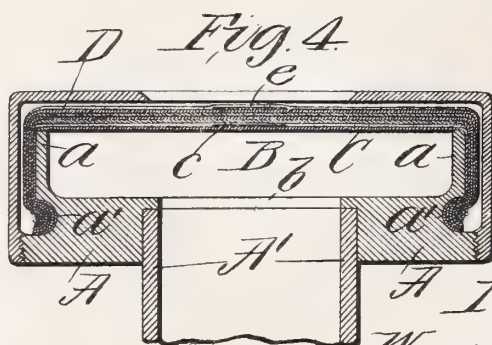
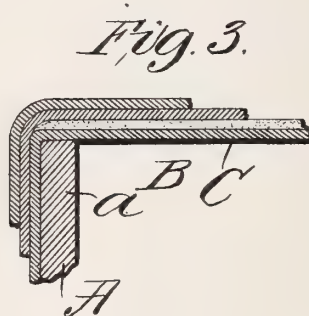
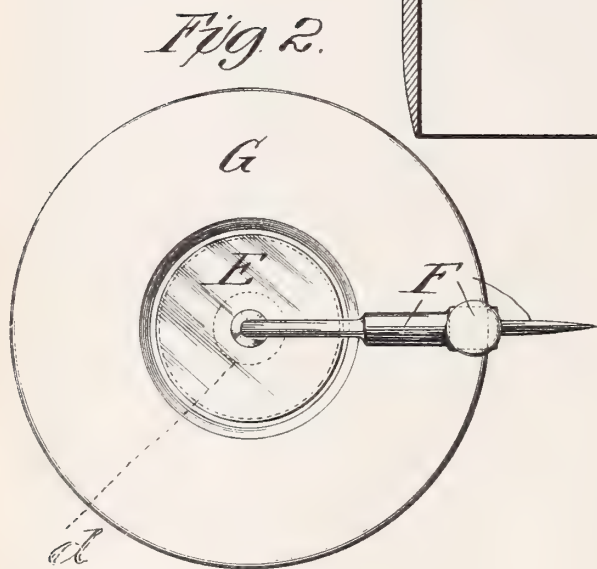
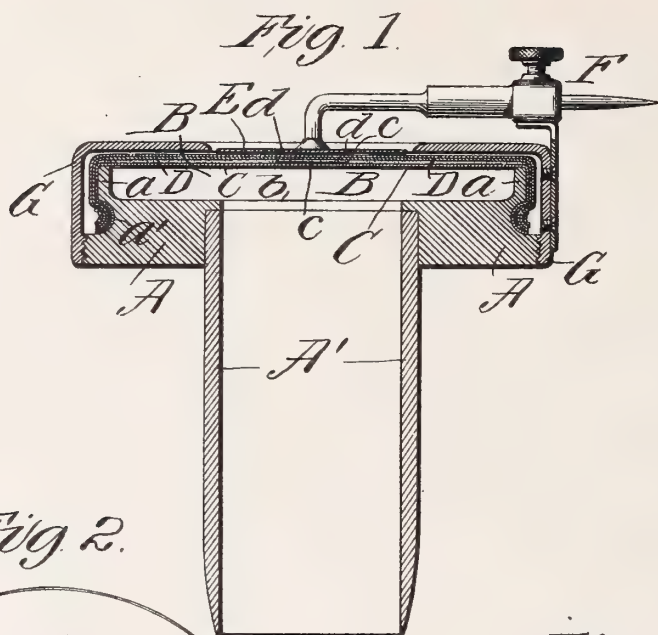
No. 671,144.

Patented Apr. 2, 1901.

W. B. OUTTEN.
DEVICE FOR TRANSMITTING SOUND.

(Application filed Aug. 4, 1899.)

(No Model.)



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UNITED STATES PATENT OFFICE.

WARREN B. OUTTEN, OF ST. LOUIS, MISSOURI.

DEVICE FOR TRANSMITTING SOUND.

SPECIFICATION forming part of Letters Patent No. 671,144, dated April 2, 1901.

Application filed August 4, 1899. Serial No. 726,100. (No model.)

To all whom it may concern:

Be it known that I, WARREN B. OUTTEN, a citizen of the United States, residing at the city of St. Louis, State of Missouri, have invented a certain new and useful Improvement in Devices for Transmitting Sound, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a vertical sectional view through my improved sound-transmitting device. Fig. 2 is a top plan view thereof. Fig. 3 is an enlarged detail sectional view. Fig. 4 is a modified form thereof, and Fig. 5 is a detail view illustrating a modified form of attaching the diaphragms to their support.

This invention relates to a new and useful improvement in devices for transmitting sound and is adapted to be used in connection with phonographs, graphophones, gramophones, telephones, stethoscopes, auscultators, or other devices wherein diaphragms are vibrated to transmit sound-waves.

The object of the invention is to produce a device of the character described which will transmit sound-waves approximating in volume more nearly the original sound-waves than in instruments of similar character heretofore made and with which I am familiar.

Being useful in connection with so many sound-wave transmitters, it will be obvious that slight modifications can and undoubtedly will be made to accommodate invention to the various uses for which it may be employed.

The invention consists, essentially, in the arrangement of the diaphragms, which diaphragms are preferably composed of animal membrane wherein muscular tissues or fibers are present in order to approximate the muscular structure of the ear-drum, wherein the tissues or fibers are matted to secure the uniform tension throughout. While I have employed animal membrane in devices of this character which I have constructed and obtained excellent results, yet it may be that there are other materials which can be employed with good results, and therefore I do not wish to be understood as limiting myself

specifically to the materials hereinafter mentioned, nor to the treatment thereof by any particular ingredients, as it is obvious that there are numerous ingredients which can be used in connection with the diaphragms without in the least departing from the nature and principle of my invention.

In the drawings, A indicates a box or housing provided with a flange *a*, forming, with the diaphragm stretched thereover, an internal sounding-chamber B, connecting with the exterior or other place by an opening *b* in the stem or tube A', extending rearwardly from the body portion A.

C indicates a diaphragm of some principal or foundation membrane, such as gold-beater's skin, which is stretched over the flange *a* and secured in position while tense in some suitable manner—such, for instance, as a cord or wire engaging the edges thereof and burying said edges in a groove in the side walls of the flange *a*. This diaphragm may be stretched while wet or green, so that upon drying it will become tense or taut. In the center of this diaphragm and preferably on the outer surface thereof I secure, by means of a suitable mucilaginous substance, a disk *c*, which disk is preferably of animal membrane, such as a fish-scale. In using a fish-scale I prefer to trim the edges, so that the radiating lines will locate the center of the scale in the center of the disk, the margin of the scale being concentric with the center thereof. By applying this disk or scale in the center of the diaphragm of membrane after the diaphragm has been placed in position still greater tension is placed on the diaphragm due to the drawing or pulling action of the securing medium for the disk and also create what I will term "tense radiating lines" from the disk, which serve to concentrate the vibration of the diaphragm to a central point. This, in my opinion, is very essential, in that the liability to the formation of dormant areas which might exist in the diaphragm is lessened, which dormant areas tend to neutralize the vibration of the diaphragm, said areas, which might otherwise be dormant, being in my construction made active by the pull of the central disk in forming these tense radiating lines. For these reasons the flange *a* is preferably cir-

cular in order that this pull may be evenly distributed throughout the surface of the diaphragm, and the disk is centrally located relative to the attachment of the edges of the diaphragm.

After the diaphragm above described is attached and made tense or taut by the arrangement of the central disk thereon said diaphragm and disk are painted or coated with some one of the essential oils—such as lanoline, oil of wintergreen, sassafras, or cloves, &c.—and then a second diaphragm (marked D in the drawings) is stretched into position over the first and secured in place. This second diaphragm may consist of one or more layers of material, preferably animal membrane, such as bladder or gold-beater's skin. Where there are a plurality of layers in this second diaphragm they are first preferably dampened, stretched, and pressed together, so as to act practically as one diaphragm. The oil coating on the first diaphragm serves to separate the two diaphragms and practically entirely fills the narrow space between. This filling of oil or other liquid being interposed between the receiving-diaphragm and the delivering-diaphragm makes each of said diaphragms sensitive and capable of slight independent vibration, yet serving as a transmitting medium, having such properties that sound-waves communicated to one of said diaphragms—for instance, the receiving-diaphragm—are transmitted accurately and positively to the other or delivering diaphragm.

When this second diaphragm is placed in position, a central disk *d* is arranged on the external surface thereof in substantially the same manner and for the same purpose as that heretofore described with reference to the disk *c*. In fact, I prefer to use a fish-scale as the disk *d* the same as that applied to the first diaphragm.

E indicates a metallic disk secured to the external diaphragm by the use of some suitable mucilaginous substance, which metallic disk is of greater diameter than the fish-scale, so that its peripheral margins extend beyond and are secured directly to the diaphragm. This metallic disk also serves to place the external diaphragm under further tension and enables the attachment of any mechanical device designed to be secured to the external diaphragm—as, for instance, the reproducing or recording needle or stylus of a gramophone, &c.

In Fig. 1 I have shown a common form of reproducing-stylus in use on gramophones, and have marked same F, although I do not claim this feature as any part of my invention.

As shown in Fig. 5, the flange *a* may be formed with a plurality of grooves, into the lowermost of which, as at *a'*, may be secured the diaphragm C, while into the upper *a''* may be secured the diaphragm D, whereby the act of securing the diaphragm D will serve to draw the diaphragm C tighter, and, if desired, an elastic band may be used for this

purpose for taking up any slack in either of the two diaphragms.

I have also discovered in experiments made with different metals used as disks (marked in the drawings as E) that different tones may be developed in the device by the substitution of one disk made of one material for another made of a different material. For instance, a disk made of gold will reproduce the bass or low tones with considerable volume, while disks made of nickel or aluminium attached to the same diaphragm will bring out the higher tones—such as alto, soprano, &c.—more distinctly. These disks of different metal thus enable me to give a key or several keys to the device, and by making these disks removable and exchangeable it is possible to develop the greatest volume of sound, depending upon the tone or nature of the sound transmitted. In furtherance of this discovery I have employed chlorids of the different metals and obtained the same result—as, for instance, painting the external diaphragm with chlorid of gold will cause the device so treated to transmit the tense or deep tones in heavy volume, while using chlorid of aluminium, nickel, &c., will render the device capable of transmitting the higher tones with greater effect.

In Fig. 1 I have shown a metal disk E, which, as stated before, may be removable, so that the key may be changed, depending upon the nature of the tone to be reproduced, while in Fig. 4 I have indicated at *e* a coating of chlorid on the external diaphragm for the same purpose. Also in Fig. 4 the external diaphragm D is made up of four layers; but I wish to be understood as not limiting myself to any number of layers, as I have found that a plurality of layers in the external diaphragm can be used to some extent to determine the key or tone of the device—that is, a less number of thin layers, such as gold-beater's skin, and a shallow sound-box, such as shown in Fig. 1, will give a high tone to the instrument, while a greater number of layers, say ten or twelve of gold-beater's skin or four or six of bladder-skin and a deep sound-box, such as shown in Fig. 4, will give a deep tone to the instrument.

G indicates a casing or shell which is employed to protect the diaphragm for well-understood purposes. In using the words "receiving" and "delivering" diaphragms I do not wish to be understood as confining such description either to the internal or external diaphragm, as in some instances, such as that shown in the drawings, the external diaphragm can properly be termed the "receiving-diaphragm" and the internal diaphragm the "delivering-diaphragm," while in other uses the internal diaphragm might be the receiving-diaphragm and the external the delivering-diaphragm.

I am aware that minor changes in the arrangement, construction, and combination of several parts of my device can be made and

substituted for those herein shown and described without in the least departing from the nature and principle of my invention.

By the term "membrane" as used in this description and the following claims in definition of the diaphragm I wish it understood that I do not mean to limit myself to membrane as technically employed, but desire to distinguish a natural animal or vegetable membrane or an artificial or manufactured membranous diaphragm from a mineral or metallic diaphragm.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. The herein-described diaphragm, consisting of two layers or thicknesses with an interposed film of liquid; substantially as described.
2. A diaphragm formed of two layers, between which is a film of liquid, and a central disk secured to at least one of said layers; substantially as described.
3. A diaphragm composed of two layers, of animal membrane and having an interposed space occupied by a film or body of oil; substantially as described.
4. A diaphragm formed of two layers of animal membrane, having a space between, and a disk of animal tissue secured to the center of at least one of said layers; substantially as described.
5. A diaphragm formed of internal and external layers, a film of oil between said layers, said external diaphragm consisting of a number of thicknesses of material pressed together; substantially as described.
6. A diaphragm composed of internal and external layers, said internal layer being provided with a central disk on its outer face, a film of oil between said two layers, said external layer consisting of a number of thicknesses of material pressed together, and a central disk secured to the outer face of said external layer; substantially as described.
7. The combination with a diaphragm composed of animal membrane, of a disk secured to the center thereof, in substantially the manner specified, by some adhesive substance, whereby said diaphragm is rendered taut or tense; substantially as described.
8. The combination with a diaphragm of animal membrane, of a disk of animal tissue secured to the center thereof by an adhesive substance, whereby said diaphragm is drawn from all points toward the center so as to form tense, radiating lines; substantially as described.
9. The combination with a diaphragm composed of animal membrane, of a circular support therefor, a disk of animal tissue which is secured to the center of said diaphragm by adhesive substance, whereby said disk draws the diaphragm toward a central point to form tense, radiating lines and overcome dormant areas in said diaphragm; substantially as described.

10. A diaphragm consisting of a plurality of flexible layers superimposed one directly upon the other, and a separating medium in the form of a liquid between said layers.

11. The combination with a sound-box having securing-flanges, of a plurality of layers stretched over said flanges and secured in position, said layers being superimposed directly one upon the other, and a film of liquid between the layers.

12. The combination with a sound-box having a circular flange, of a plurality of layers stretched thereover and secured in position, said layers being superimposed directly upon each other, film of liquid interposed between said layers, and a central disk on one of said layers.

13. The combination with a diaphragm of animal membrane, of a metallic chlorid secured thereto, substantially as and for the purpose described.

14. The combination with a support, of a diaphragm stretched thereover, a disk secured to the center of said diaphragm in substantially the manner specified, and a chlorid coating for developing high or low tones; substantially as described.

15. The combination with a support formed with a plurality of grooves, of a plurality of diaphragms secured to said support by suitable fastening devices, whereby the attachment of the outer diaphragm serves to render more tense the inner diaphragm; substantially as described.

16. The combination with a suitable support formed with a plurality of grooves, of a diaphragm stretched over said support and over at least one of said grooves, means for securing said diaphragm in the lower groove, a second diaphragm, which is stretched over the first-mentioned diaphragm, and securing devices for forcing the edges of said second diaphragm into the upper groove, whereby the diaphragm first applied is tightened; substantially as described.

17. The combination with a support formed with a plurality of grooves, of a diaphragm stretched thereover and secured in the lowermost of said grooves, and another diaphragm stretched over the first-mentioned diaphragm, which second diaphragm is designed to be secured in the upper groove, and an elastic band for securing said second diaphragm into the upper groove, whereby the first-mentioned diaphragm is pressed into said upper groove; substantially as described.

18. A diaphragm for the purpose described treated with a chlorid, substantially as described.

In testimony whereof I hereunto affix my signature, in the presence of two witnesses, this 31st day of July, 1899.

WARREN B. OUTTEN.

Witnesses:

F. R. CORNWALL,
A. S. GRAY.



J. D. BLAGDEN.
MULTIDISK PHONOGRAPH.

(Application filed June 11, 1900.)

(No Model.)

3 Sheets—Sheet 1.

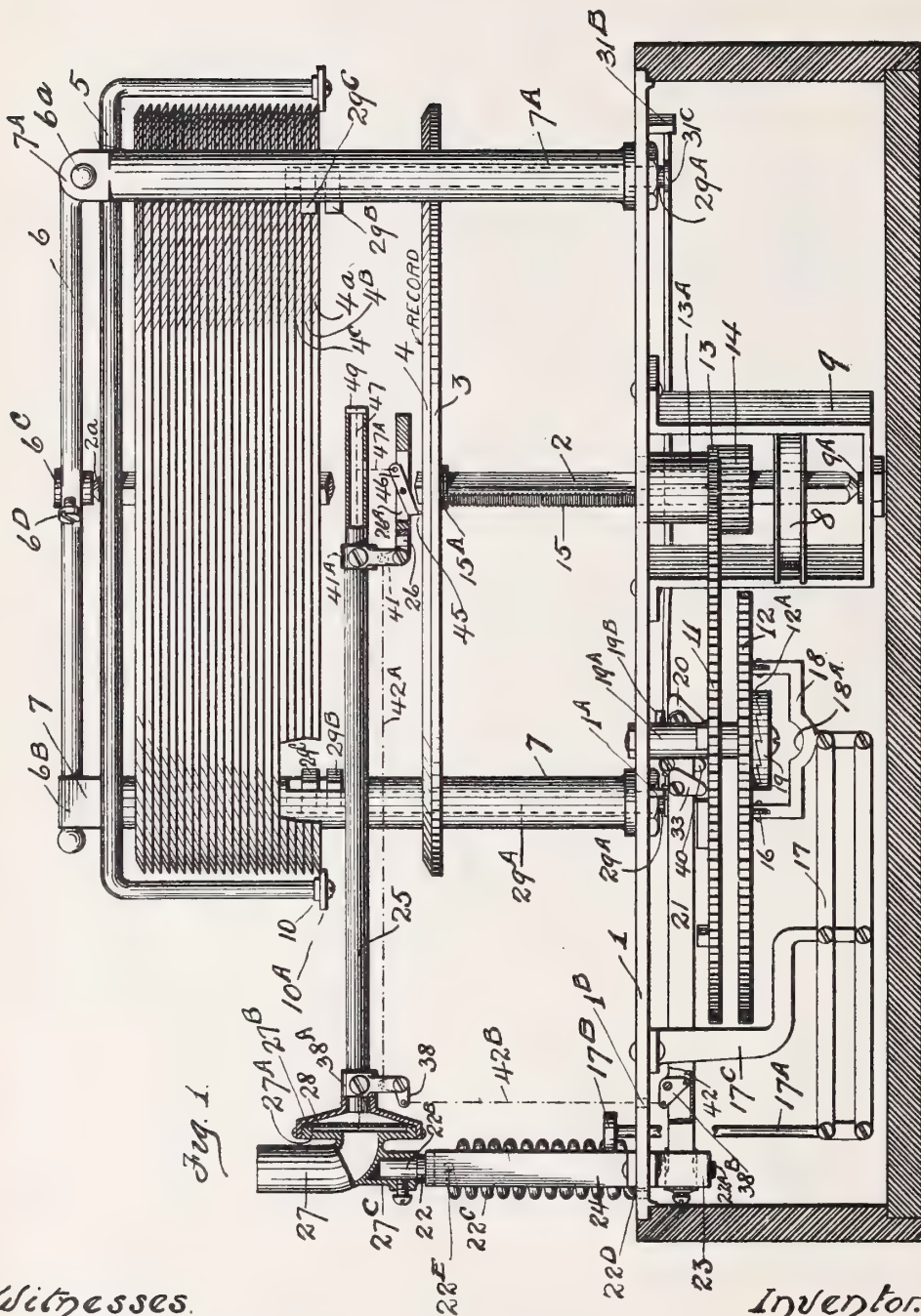


Fig. 1.

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No. 671,305.

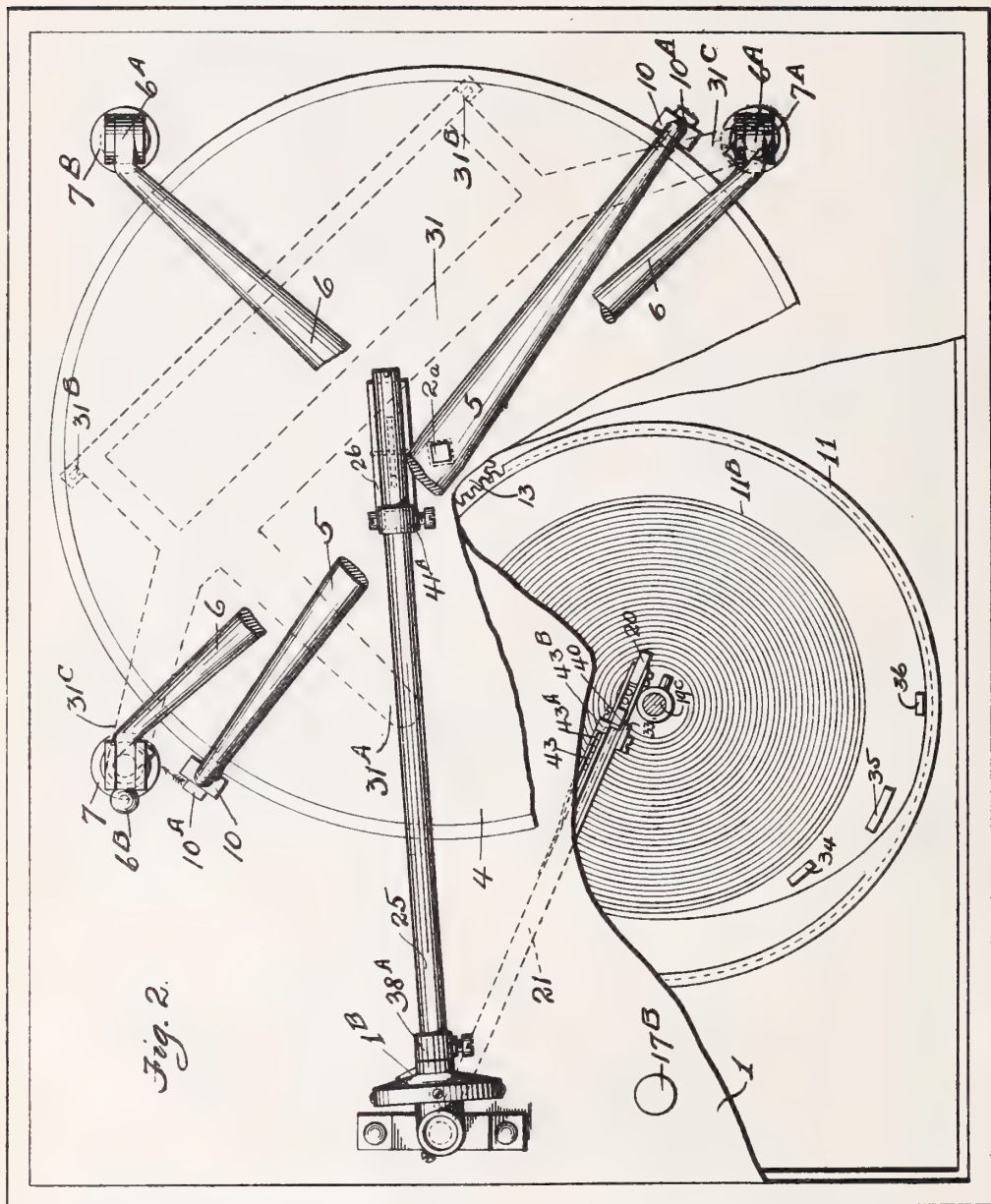
Patented Apr. 2, 1901.

J. D. BLAGDEN.
MULTIDISK PHONOGRAPH.

(Application filed June 11, 1900.)

(No Model.)

3 Sheets—Sheet 2.



Witnesses

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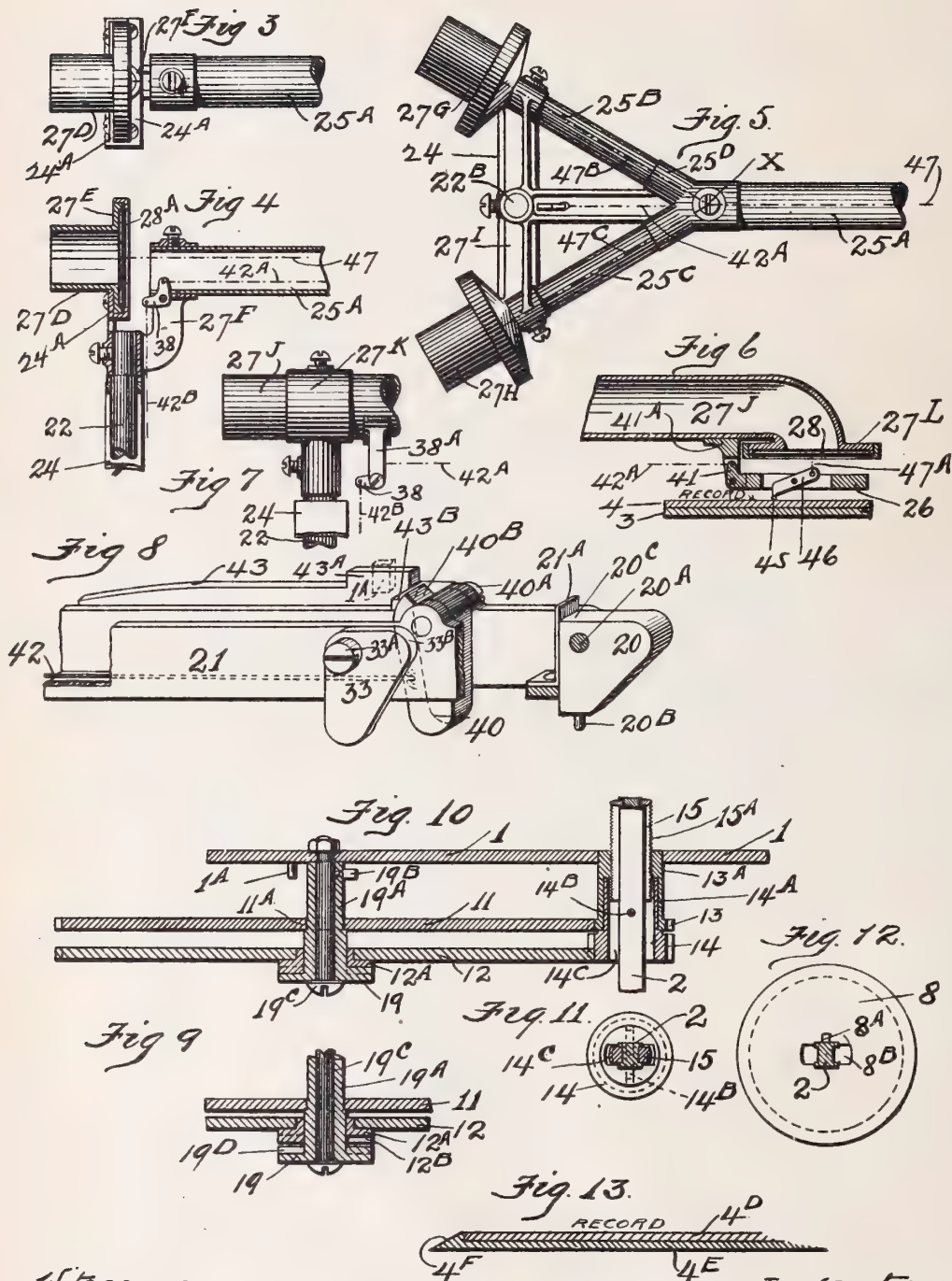
John D. Blagden
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J. D. BLAGDEN.
MULTIDISK PHONOGRAPH.

(Application filed June 11, 1900.)

(No Model.)

3 Sheets—Sheet 3.



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UNITED STATES PATENT OFFICE.

JOHN D. BLAGDEN, OF MEMPHIS, TENNESSEE.

MULTIDISK PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 671,305, dated April 2, 1901.

Application filed June 11, 1900. Serial No. 19,890. (No model.)

To all whom it may concern:

Be it known that I, JOHN D. BLAGDEN, a citizen of the United States, residing at Memphis, Shelby county, State of Tennessee, have invented certain new and useful Improvements in Multidisk Phonographs, of which the following is a specification.

My invention relates to apparatus for recording and reproducing speech, known as "phonographs," and has special reference to that class of phonographs in which the sound-record is made on flat disks.

It has for its object, primarily, to provide means whereby a subject of considerable length may be recorded and reproduced, or a series of short records may be made and reproduced in the same or in any predetermined succession continuously and automatically. It has also for its object the improvement of the details of phonographs. I accomplish the first of these objects by storing a plurality of record-disks in reserve and by automatically placing each of these disks in succession when the preceding records have been completed, by lowering the disk-table during the reproduction, so that the top of each successive record shall be at the same height at the beginning of each record, and by moving the reproducing-point over the records and returning same automatically after completion of each. I improve the details by a novel method of raising the reproducer-point and by the automatic means of accomplishing this, by the connection of the reproducer-point with the diaphragm, by the manner of supporting the reproducer-arm, and by the means of following an irregular record, as will be hereinafter more fully described in this specification.

In the accompanying drawings, which illustrate my phonograph, Figure 1 is a side elevation showing the multiple record-disks stored in the storage-bracket at the beginning of the record, with one disk in place and the reproducer in position to begin. Fig. 2 shows a plan with the stored records removed, the top frame broken away in order to show the reproducer-arm, and with the record-disk and the bed-plate partially broken away to show the directing or guiding spiral which moves the reproducer across the record. Fig. 3 shows a plan, and Fig. 4 a sectional elevation,

of a modification of some of the details. Fig. 5 is a plan of a modification in which two diaphragms are used. Fig. 6 is a section, and Fig. 7 an elevation, of the two ends of the reproducer-carrying arm, showing a modification in which the diaphragm is carried on the end of a horizontally-swinging arm directly over the reproducing-point. Fig. 8 is a mechanical perspective of an end of the guiding-arm, showing various cams or knees thereon. Fig. 9 is a sectional detail showing clutches disengaged. Fig. 10 is a sectional detail of the differential gear which regulates the height of the disk-table. Fig. 11 is a plan view of the driving-pinion, showing section of driving-shaft and segmental screw. Fig. 12 is a plan of the driving-pulley. Fig. 13 is a section of a record-disk.

Referring now to the drawings, in which like numerals represent like parts in all the views, 1 is the base-plate, which carries the three frame-posts 7, 7^A, and 7^B, to the upper ends of which a top frame 6 is hinged at the points 6^A in the posts 7^A and 7^B, the end 6^B of the top frame 6 resting in the top of the post 7. This top frame 6 carries a bearing 6^C, held by means of a set-screw 6^D or like convenient means, which is the upper bearing for the driving-shaft 2. The lower bearing 9^A for the shaft 2 is carried by a bracket 9, bolted or riveted to the under side of the base-plate 1. The driving-shaft 2 is rotated by a driving-pulley 8, which is fastened to said shaft by means of a key 8^A, (shown in Fig. 12,) or, if it is so desired, by means of a pin (not shown) inserted through the pulley and the shaft. The pulley 8 (see Fig. 12) touches the driving-shaft 2 on two of its sides only. On the other two sides spaces 8^B are left, through which spaces the segmental screw 15 is free to pass.

14 (see Figs. 10 and 11) is a driving-pinion which is fastened to the shaft 2 by a pin 14^B, inserted through the shaft and the pinion. The upper part of this pinion is turned down to give a cylindrical portion 14^A, on which is journaled a second pinion 13, which has integral with it at its upper end a nut 13^A, with which mesh the threads on the segmental screw 15, which is slidably mounted on the driving-shaft 2. This segmental screw 15, as shown in Fig. 11, is apparently composed of

two pieces oppositely disposed in grooves in the driving-shaft 2; but reference to Fig. 1 shows that the upper end of these pieces is connected by an annular portion 15^A, which screws into the disk-table 3, which table supports the record-disk 4 while it is in use. Geared to the driving-pinion 14 is a large gear 12, and concentrically mounted therewith is another gear 11, which carries the directing-spiral 11^B. I will in this specification designate the gear 11 as the "directing-gear" 11. The directing-gear 11 meshes with the pinion 13, which is journaled on the driving-pinion 14. The directing-gear 11 is rigidly fastened to a hollow spindle 19^A, which is free to turn upon a spindle 19^C, rigidly fastened to the bed-plate 1. The lower end of the spindle 19^A carries a clutch 19, (more fully shown in Fig. 1,) which clutch engages with a clutch 12^A, fastened to the gear 12, loosely mounted on the hollow spindle 19^A.

The directing-gear 11 is made with one tooth more than the gear 12, so that when the gear 12 is driven by the driving-pinion 14 the gear 11, rotating with the gear 12, drives the pinion 13 at nearly the same rate of speed as that of the driving-pinion 14, moving them relatively one tooth during each revolution. The teeth on gears 11 and 12 and the thread on the segmental screw 15 are so related that in making a complete reproduction of any record, as that on the disk 4, the pinions 13 and 14 move relatively to each other a sufficient number of times to lower the disk-table 3 and the record-disk 4 exactly the thickness of one disk, thus bringing the upper portion of the disk 4 in the same position at the end of the record that the upper portion of the disk-table 3 occupied at the beginning of the record, the object of this being to make use of the record-disk 4 as a table upon which to bring another record-disk 4^A down to have each disk in turn to form the table for the succeeding disk, making it possible to reproduce all the stored records in succession without removing the former record.

Fig. 9 shows the gear 12 and the attached clutch 12^A, with the teeth 12^B on the said clutch disengaged from the teeth 19^D on the clutch 19. In this case the gear 12 is free to rotate upon the spindle 19^A, which spindle, as before mentioned, carries the gear 11, and is therefore free to rotate relatively to the said gear 11. To raise the gear 12 and the clutch 12^A attached, I show in Fig. 1 a fork 18, carrying rollers 16 at the upper end of its arms, which rollers bear against the under side of the gear 12 when the fork is put into use. This fork 18 is carried by parallel bars 17, which are supported on a bracket 17^C, fastened to the base-plate 1. At the left-hand end of these bars, as shown in Fig. 1, a rod 17^A is fastened, which rod terminates in a button 17^B. By pressing down upon this button the fork 18 is raised and the rollers 16 press against the under side of the gear 12 and raise same until the clutch 12^A disengages from the clutch

19. Any further motion brings the fork 18 against the under side of the clutch 19 as a brake. The fork is cut away at 18^A to allow the fork 18 to bear against the under side of the clutch 19 without touching the stationary spindle 19^C. When this brake comes against the clutch 19 and stops it, it holds the hollow spindle 19^A and the gear 11 attached thereto stationary. If now the pulley 8, attached to the main driving-shaft 2, be rotated, the gear 11 holds the pinion 13 and its attached nut 13^A stationary and causes the segmental screw 15 to raise or lower rapidly, depending on the direction in which the driving-pulley is rotated. This gives a quick means of raising the segmental screw 15 and the attached disk-table 3, carrying the records 4 4^A, &c., when the entire set of records or any desired portion thereof have been used and it is desired to begin anew. It also furnishes a rapid means of bringing any desired record into place should it be desired at any time to skip one or more of them.

Upon the face of the directing-gear 11 I cut a spiral groove 11^B, which I call the "directing-spiral." A guiding-pin 20^B, projecting from the lower portion of the guiding-knee 20, which knee is carried by a guiding-arm 21, works in this groove and by means of connecting-pieces directs the motion of the reproducer-point over the record 4 4^A, &c. The arm 21 is fastened by a set-screw or other convenient means to the lower end 22^A of an oscillating spindle, which spindle has the reproducer-arm 25 fastened to it at its upper end 22^B.

23 and 24 are brackets, fastened, respectively, underneath and above the base-plate 1, which carry the oscillating spindle 22. These brackets are preferably fastened, as shown, by the same rivets or bolts to the base-plate. The upper end 22^B of the oscillating spindle 22 is slightly reduced in size, and on this reduced portion is fastened the bracket 27^C, which carries the reproducer-arm 25. This bracket 27^C, as shown in Fig. 1, is an extension of a tubular sound-conveyer 27, which I have shown terminating vertically.

27^A is a circular plate which carries the diaphragm 28. 27^B is a conical cover which is fastened to this circular plate 27^A and which carries the reproducer-arm 25, to which it is rigidly attached. The reproducer-arm may be made of any convenient form, but I have shown it in the drawings attached as a tube.

The reproducer-arm 25 is rigidly fastened to the oscillating spindle 22, so that while free to move horizontally, or, rather, to be moved horizontally, it has no vertical motion whatsoever except such as is incidental to the play of the spindle 22 in its bearings. It is intended then that none of the weight of the reproducer-arm shall rest on the record. The free or swinging end of the reproducer-arm 25 carries a bracket 41^A, in which is pivoted a tension-lever 26, which carries in turn the reproducer-point 45. The reproducer-lever 46

is pivoted near its center in the tension-lever 26. One end carries the reproducer-point 45 and the other is attached by a short cord 47^A to the reproducer-cord 47, which leads to the diaphragm 28. The cord 47^A passes through an opening in the under side of the reproducer-arm 25, which, as stated, is tubular and is attached at right angles to the reproducer-cord 47. One end of the cord 47 is attached to a piece 49 at the end of the reproducer-arm 25 and leads thence through the center of the said arm to the diaphragm 28 at the opposite end thereof. When the phonograph is reproducing, the reproducer-point 45 rests by its own weight and the weight of the tension-lever 26 upon the record 4. When the record has been completed and it is necessary to carry the arm 25 back to its initial position to begin a record, it is necessary to raise the reproducer-point 45 from the record. Ordinarily this is done by raising the entire arm 25 and the diaphragm attached clear of the record. I accomplish this, however, by means of an arm 41 at right angles to the tension-lever 26, which arm is attached by a cord 42^A to a bell-crank 38, carried at the opposite end of the arm 25, and is thence connected by the second cord 42^B to another bell-crank 38^B, which is carried on the guiding-arm 21. This last bell-crank 38^B is connected by a cord 42, which passes along the guiding-arm 21 and is attached near the free end thereof to the knee 40, which knee is automatically tripped at the end of the record by a cam 34 on the upper face of the directing-gear 11 when the record shall have been completed.

1^B is a slot in the base-plate 1, through which the cord 42^B passes.

When the knee 40 strikes the cam 34 on the upper face of the gear 11, it pulls the cord 42 forward and raises the tension-weight 26, which carries the reproducer-lever 46, thus raising the reproducer-point from the record, as above stated. As the knee 40 moves forward the spring 45 catches on the top of lug 40^B on the knee 40 and holds the same until the arm 21 shall have swung back to its original position at the beginning of the record and the lug 43^A on the spring 43 shall have come in contact with the pin 1^A, which projects from the under side of the base-plate 1. This pin 1^A stops the spring 43, while the swinging arm 21 continues to move, thus disengaging the lug 43^B from the lug 40^B and allowing the reproducer-point to again drop on the record. The gear 11, turning still farther, brings the cam 35 in contact with the knee 33, also carried by the swinging arm 21, revolving same about the pin 33^A and bringing the point 33^B, Fig. 8, into its highest position just when the knee 33 is under the end of the arm 31^A (shown in Fig. 2) of the hinged piece 31, thus raising the said arm 31^A and piece 31, to which it is attached, upward. The piece 31 is pivoted at 31^B and has the arm 31^A and the arms 31^C extending outward from it. The arms 31^C extend beneath the

post 7 and 7^A, which are hollow and support rods 29^A, which extend upward in these hollow columns. The rods 29^A terminate in lugs 29^B and 29^C, (designated from their purpose as "tripping-lugs,") which lugs project through slots cut through the posts 7 and 7^A.

5 is a record-storage bracket resting at 2^A on top of the main shaft 2 and revolving therewith. It has at its lower end lugs 10 and 10^A to support the stored records 4^A 4^B, &c. These lugs, as shown in Fig. 2, are rectangular in shape, disposed at right angles to each other, with one lug 10 above the companion lug 10^A. The lowest record-disk 4^A rests on the lug 10^A and with the remainder of the stored plates is carried around as the shaft 2 and bracket 5 revolve. The tripping-lugs 29^B and 29^C above mentioned are so spaced and normally so disposed that the lug 10^A passes between them as the bracket 5 revolves, and they are further sufficiently distant from the bracket 5 to allow the lug 10, having its line of greatest length at right angles to the direction of motion, to clear them. When, however, the knee 33 comes under the arm 31^A and raises it, and with it the attached arms 31^C, these arms 31^C raise the rods 29^A and the lugs 29^B and 29^C attached, bringing the lug 29^B into the path of the lug 10^A, so that it will engage the said lug and cause it to turn and at the same time bringing the space between the lugs 29^B and 29^C into the path of the lug 10, thus allowing same to turn freely, and thus dropping the lowest record-disk 4^A and allowing the next record 4^B to drop on the lug 10, which is turned under it as the piece 10^A is turned from under the lower record. As soon as the cam 35 passes from beneath the knee 33 it allows the arm 31^A, and with it the arms 31^C, carrying the posts 29^A, to drop and brings the tripping-lug 29^C into the path of the lug 10. This lug, striking the tripping-lug 29^C, rotates a one-quarter turn as before and drops the stored records on the lug 10^A, where they remain until the record 4^A, which has been dropped on top of the record 4, has been reproduced. Just prior to dropping a new record, however, the arm 21, guided by the directing-spiral 11^B on the gear 11, which arm has been moving outwardly uniformly, brings the knee 40 into position and it is struck by the cam 34, which pushes it forward and raises the reproducer-point 45 from the record. At this point the arm begins to move outward much more rapidly and continues to so move until the reproducer-arm 25, carrying the reproducer-point 45, is clear of the record-disks. The spiral 11^B continues then in a circular arc for a sufficient part of one revolution to allow the placing of a new record, as just described. The stored plate 4^A is therefore free to drop to the top of the record 4, which is supposedly already in place on the disk-table 3. As soon as the record 4^A drops the cam 36 on the directing-gear 11 strikes the knee 20 and raises the point 20^B (shown in Fig. 8) out of the spiral groove 11^B.

Referring again to Fig. 8, it will be seen that the knee 20 rests against a spring 21^A, which is riveted or otherwise rigidly fastened to the arm 21, the knee being held in place by the pressure of this spring against the corner 20^C of the knee. Now when the cam 36 strikes the knee 20 it rotates about the pin 20^A and the corner 20^C presses against the spring 21^A until the knee 20 shall have been turned at right angles to the position shown in Fig. 8, at which time the spring 21^A presses against the upper face of the knee 20 and holds same until means shall have been applied to replace it. This means is furnished when the arm 21 shall have turned to the center to begin a new record by bringing the knee 20 against a pin 19^B. (Shown in Fig. 1.) This pin 19^B is fastened into the hollow rotating spindle 19^A, which carries the directing-gear 11. The pin 19^B strikes the upper side of the knee 20 and forces it down into its original position, bringing the point 20^B thereon into the spiral groove 11^B at its point of beginning near the center of the gear 11. The guiding-arm 21, carrying with it the reproducer-arm 25, is swung back to this central position by means of a spring 22^C, which is fastened at 22^D into the base-plate 1 and at 22^E into the spindle 22. As soon, therefore, as the pin 20^B on the knee 20 has been raised out of the spiral groove at the outside of the gear 11 this spring 22^C comes into action and carries the arm 21 back to the center, with the result before mentioned—namely, the hollow spindle 19^A, turning, carries the pin 19^B against the upper part of the knee 20 and forces the point 20^B down into the spiral groove 11^B on the directing-gear 11. Immediately thereafter the pin 1^A strikes the lug 43^A on the spring 43 and moves the lug 43^B on the said spring out of engagement with the lug 40^B on the knee 40, thus allowing the reproducer-point 45 to rest on the record 4^A, which has been placed as above stated, starting thus the reproduction of the record.

I have confined this description so far to a diaphragm 28, which is carried in an extension 27^A 27^B of the speaking-tube 27, which is rigidly attached to the reproducer-arm 25, the vibrations being carried from the reproducer-point 45 to the diaphragm 28 by the reproducer-lever 46, connected by a cord 47^A to a cord 47, extending along the center of the hollow reproducer-arm 25 and attached to the diaphragm 28 at its center. When, therefore, the arm 25 swings around, the diaphragm swings with it, keeping the cord 47 always at right angles to the said diaphragm, to which it is attached.

In Figs. 3 and 4 I have shown a modification in which the diaphragm 28^A is carried in a holder 27^E, supported by a bracket 24^A, bolted to the bracket 24, the center of the diaphragm being exactly over the center of the oscillating spindle 22, which spindle extends up through this bracket 24. The reproducer-arm 25^A is carried, as before, by a bracket

27^F, fastened rigidly to this spindle. The reproducer-arm 25^A, oscillating with the oscillating spindle 22, keeps the cord 47 always taut, and although the diaphragm 28^A is stationary the sound is reproduced in exactly the same manner as where the diaphragm is carried on the moving shaft. In this case, too, I have shown the hollow reproducer-arm 25^A as of slightly-larger size than that shown in Figs. 1 and 2 in order to carry the cord 47 near the upper part of the arm instead of through the center of same, and thereby to leave space at the bottom to bring the cord 42^A also, which cord raises and lowers the reproducer-point 45, inside of this tube, obtaining in that way protection for both.

In Fig. 5 I have shown a modification in which I carry two diaphragms in holders 27^G and 27^F, which diaphragms are connected by means of cords 47^B and 47^C, respectively, with the main cord 47, leading, as before, to the end of the reproducer-arm 25^A. These cords 47^B and 47^C are joined at the point X (shown in Fig 5) to the cord 47 and are protected by a Y-shaped extension of the tube 25^A, through the branches 25^B and 25^C of which these cords pass. The tripping-cord 42^A extends through an opening (not shown) in the lower part of the Y 25^D and is further protected by the frame 27^I, which carries the reproducer-arm 25^A and its Y branches 25^B and 25^C, with the diaphragms thereon.

In Fig. 6 I show a still further modification of the reproducer-arm, in which the diaphragm 28 is carried on the end of the reproducer-arm 27^J and is connected immediately with the reproducer-lever 46 by means of the short cord 47^A, the longer cord 47 used in the other cases being dispensed with. In this case I have shown the cord 42^A, which raises and lowers the reproducer-arm 46, unprotected as in the first case. The reproducer-arm 27^J in this case is the sound-conveyer and speaking-tube also.

Fig. 13 shows a section of a record, showing the wax or wax-like surface 4^D, carried on a plate 4^E of sheet metal. This plate is thickened at the edge to protect the edge of the record and to allow the part 4^F to be beveled in order to permit the action of the pieces 10 and 10^A, before described.

I desire to call special attention to the fact that the arm 25, which carries the reproducer-tension-lever 26 and the reproducer-lever 46 and point 45, is free to move in a horizontal plane, but that it has no vertical motion. The shaft 22, however, is made and so placed in the brackets 23 and 24 that it may be raised bodily a small distance. In raising this shaft the reproducer-arm 25 and the guiding-arm 21 are both raised through their entire lengths. It is thus possible to raise the reproducer-point 45 clear of the record and the guiding-point 20^B clear of the directing-spiral 11^B and to swing them to one side to clear the record and allow same to be removed or to allow new records to be put in place. It also pro-

vides means of changing the reproducing-point from one part of the record to another and to reproduce any part of a record. The advantage of this construction is that I can make a stiff and durable arm and not damage the record by excessive weight upon it. I am also enabled thereby to use a much larger record, as I am not limited by the weight of this arm. All the vertical motion necessary to raise the reproducer-point 45 and the reproducer-lever 46 clear of the record is obtained by raising the tension-lever 26 by means of the cord 42^A working through the bell-cranks 38^B, 38, and 41. I am thus enabled to use an arm of any length or weight that I desire without fear that it will press too hard upon the record and cut or destroy same. The entire pressure of the record in the case of this arm is governed by the weight of the reproducer tension-weight 26. This tension-weight is pivoted in a bracket 41^A, carried near the end of the reproducer-arm 25, 25^A, or 27^A, as the case may be. The reproducer-lever 46 is pivoted in the tension-weight 26 and is connected by the cord 47^A directly to the diaphragm 28 or by means of the cord 47 with the diaphragm 28, as the case may be. Now when the reproducer tension-weight 26 is lowered by the slacking of the cord 42^A the reproducer-point 45 is lowered till it rests on the record. The reproducer tension-weight 26 exerts a constant pressure through the lever 46 to press the point 45 on the record and at the same time it produces a constant tension of the cord 47^A. It will be seen that inequalities in the record will be followed by the reproducer-point 45. In this case the reproducer-point 45 is expected to follow the whole thickness of the records, being the amount that the disk-table lowers during each record.

Having described in detail the different parts of my phonograph, the action of the same is as follows: A record 4 having been placed on the disk-table 3, the phonograph is started by means of mechanism, (not shown or described,) which may be a motor placed in one corner of the box and driven by a belt through the pulley 8 or by any other desired means, for which means I make no claim. The operating mechanism, however, having been set in motion, the record is rotated, and at the same time the pinion 14, keyed to the shaft 2, rotates the gear 12 and through clutches 12^A and 19 the directing-gear 11. As this gear rotates the point 20^B on the knee 20 moves slowly outward in the spiral groove 11^B, carrying the arm 25 outward from the center at the same time, the plate carrying the record 4 being rotated more rapidly than is the gear 11 in the ratio of the diameters of the gear 12 and the pinion 14. The spiral, therefore, on the record 4 is much closer than the groove cut in the upper portion of the directing-gear 11, by which means a very fine and close record may be made on the disk 4 with a comparatively coarse spiral on the directing-gear. During this time the gears 11 and

12 slowly rotate the nut 13^A with reference to the segmental screw 15. The thread on this segmental screw and the number of teeth on the gears 11 and 12 are so related that when the record shall have been completed the nut 13^A will have lowered the said segmental screw the thickness of one record. The reproducer-arm 25 having completed the record on the disk 4, the cam 34 is in such position that it strikes the knee 40 and raises the tension-weight 26, and with it the reproducer-point 45, clear of the record. The directing-groove passes rapidly toward the edge of the gear 11 and swings the reproducer-arm 25 clear of the record and record-table 3. As the arm 25 swings clear the cam 35 strikes the knee 33 and raises the arm 31^A and attached arms 31^C, which raise the rods 29^A and bring the lug 29^B thereon into engagement with the lug 10^A, rotating it a one-fourth turn, and drops the record 4^A downward upon the completed record 4, the lug 10 by the same rotation having engaged the second record 4^B and prevented it from falling. As soon as the cam 35 passes the knee 33 the knee 33 drops back to its original position and allows the rod 29^A, carrying the lugs 29^B and 29^C, to drop to its original position. This brings the lug 29^C into engagement with the lug 10, which it rotates a one-fourth turn, allowing the stored records to drop to the lug 10^A, as before. Immediately after this is done the cam 36 in the gear 11 strikes the knee 20 and raises the point 20^B clear of the spiral groove in the upper face of the gear 11, the knee being held in its raised position by the spring 21^A. This releases the guiding-arm 21 and allows the coil-spring 22^C to throw the same and the reproducer-arm back to the center. The lug 40^A on the spring 43 engages the pin 1^A, fastened in the under side of the base-plate 1. This disengages the spring 43 from the knee 40 and allows same to drop to its original position, and with it the reproducer-point 45, to come down upon the record-disk 4^A. The hollow spindle 19^A, rotating, brings the pin 19^B against the upper part of the knee 20 and turns this knee down, bringing the point 20^B into the spiral groove 11^B in the directing-gear 11 and the reproduction begins anew, as with the first record. This is repeated until all the records or any desired portion thereof shall have been used. It will be seen that by storing a number of records (I have shown twenty-three in the drawings) a subject of considerable length may be reproduced. The delay incident to changing from one record to the next being short, the interruption will amount to almost nothing. In the case of a speech extending over considerable space of time this will be extremely valuable. While the reproducer is traversing the records the record-table is slowly lowered by means of the differential gears 11 and 12, being lowered each time exactly the thickness of one record. If all the records are used, this will bring the record-table 3 to the bed-plate. When all the records in the

bracket 5 have been transferred to the record-table 3, or if at any time during the reproduction it is desired to begin again, the top frame is thrown back and the records are lifted off the record-table 3 and out of the phonograph. They are then replaced in the bracket 5 and the same is placed again over the shaft 2. The button 17^B is now pressed, and the fork 18 raises the clutch 12^A, attached to the gear 12, out of engagement with the clutch 19, attached to the gear 11. Further pressure on the button 17^B causes the upper face of the fork to engage the under side of the clutch 19 on the gear 11 and prevents the rotation of the pinion 13, carrying the nut 13^A. If now the shaft 2 be rotated, the segmental screw 15 will rise rapidly through the nut 13^A until the record-carrier 3 comes to its original position, at which time the button 17^B may be released, and the arm 25 having been brought to the center reproduction begins anew. It is of course possible to throw the button 17^B in at any time and by reversing the motion of the shaft 2 to lower the disk-table 3 to any desired point, and by dropping the proper number of records 4^A, 4^B, &c., on this disk-table it is possible to begin at any point.

While in the attached claims I have introduced some of the details of construction, I wish it understood that I reserve the right to vary the minor details herein described without prejudice to my interests.

Having thus fully described my phonograph, what I claim, and desire to secure by Letters Patent of the United States, is—

1. In a phonograph, the combination with the reproducer and means of causing same to be moved over a record, of a disk-table, a plurality of records carried above said disk-table and means of dropping each of said records into place successively, at the end of each reproduction, substantially as shown and described.

2. In a phonograph having disk-records, the combination with a horizontal swinging arm, a reproducer carried thereon, means of causing said reproducer to follow a record and means of rotating said record, of a disk-table, a plurality of records supported above said table, and means of dropping said records into position successively and automatically after the completion of each record, substantially as shown and described.

3. In a phonograph, the combination with a rotating shaft, a record-carrying-disk table carried thereon, a bracket carried on said shaft supporting a plurality of records, and means of automatically dropping each of said records successively, substantially as shown and described.

4. In a disk-record phonograph, the combination with a rotating shaft, a disk-table mounted thereon, a bracket mounted on said rotating shaft adapted to carry a plurality of disks, lugs on the bottom of said bracket to support the disks, and means of automatically

rotating said lugs at the completion of each record to drop another record into place, substantially as shown and described.

5. In a phonograph, the combination with a rotatable shaft, a record-carrying table mounted thereon, a record thereon, a bracket carried by said rotating shaft adapted to hold a plurality of record-disks, lugs on the bottom end of said bracket adapted to support said records, suitable bearings for said rotating shaft and a suitable frame to carry said bearings, said frame having hollow posts, rods mounted in the hollow posts of said frame, said rods having lugs on their upper ends to engage the lugs on the lower end of the storage-bracket, the lugs on the said rods being normally out of the path of the bracket-lugs, and means of raising said rods to cause the lugs to turn thereon to come into the path of and engage with the lugs on the lower end of the bracket to cause one of the storage-records to drop into position automatically, when the record below shall have finished, substantially as shown and described.

6. In a phonograph, the combination with a suitable base-plate, a suitable frame mounted thereon, a shaft carried in bearings in said frame, said shaft carrying a disk-table, a bracket for storing a plurality of records, lugs on the lower end of said bracket, rods, in the hollow posts of said frame, resting on a hinged piece, the said hinged piece underneath the said base-plate and means of raising the hinged piece automatically, to raise the rods in the hollow posts and cause the lugs on said rods to engage the lugs on the record-storage bracket, to drop a record into place at the completion of a former record, substantially as shown and described.

7. In a phonograph, the combination with a base-plate, a suitable frame mounted thereon, gearing carried beneath the said base-plate, a shaft pivoted in bearings in said frame, said shaft having pinions thereon to engage the said gearing, a record-carrying-disk table mounted on said rotating shaft, a record-storage bracket carried on the upper end of said rotating shaft, lugs on the lower end of said bracket to support the stored records, rods set in the hollow posts of the frame, lugs on the rods projecting through holes in the sides of the posts, a swinging piece under the base-plate having arms on which the rods rest, a cam on the upper gear, a swinging arm, a knee pivoted near the end thereof and means of bringing the swinging arm to such position that the said knee thereon will be engaged by the lug on the gear, and will raise the said swinging piece and the rods supported thereon, and thereby cause the lugs on the rods, to come into the path of, and to engage the lugs of the storage-bracket and rotate same to drop a record into position at the completion of the former record, substantially as shown and described.

8. In a phonograph, the combination with a base-plate a suitable frame thereon, a driv-

ing-shaft rotating in bearings in said frame, a record-carrying-disk table slidably mounted on said shaft, a record-storage bracket carried on said shaft, and means of dropping
5 each record successively into place, automatically upon the completion of the preceding record, of differential gearing to lower the record-carrying disk through the thickness of a record, substantially as and for the purposes set forth.

9. In a phonograph, the combination with a base-plate, a suitable frame mounted thereon, a driving-shaft journaled in said frame, a record-carrying-disk table slidably mounted
15 thereon, a storage-bracket carried on the upper end of said shaft, a plurality of records carried by said bracket and means of dropping successive records into place, of a segmental screw fastened to said disk-table and
20 slidably mounted on said shaft, a nut rotatably mounted on said shaft and engaging said segmental screw, and differential gearing for rotating said nut relatively to said shaft and segmental screw, to lower the disk-table
25 through the thickness of one record-disk during the reproduction of a record, substantially as shown and described.

10. In a phonograph the combination with a rotating record-table and a record thereon,
30 of a horizontal swinging arm carrying a reproducer on the swinging end thereof, and means of causing the arm to swing away from the center of the record-table and the record thereon and to follow a spiral record, said
3 means consisting of a separate guiding-spiral of coarser pitch, a point to follow said spiral and means of connecting this point with the reproducer-point, substantially as shown and described.

11. In a phonograph, the combination with a record-table, a record thereon, a horizontal swinging reproducer-arm, moving thereover,
40 said arm carrying a record-reproducer, and means of causing said reproducer to follow the record consisting of a rotating gear with a spiral groove in the web thereof, a swinging guiding-arm rigidly fastened through a
45 vertical spindle to the said reproducer-arm, a point on the end of said guiding-arm engaging with the spiral groove in the web of the said rotating gear, and means of rotating said gear substantially as shown and described.

12. In a phonograph, the combination with
55 a rotatable record-table, a horizontally-swinging reproducer-arm carrying the reproducer-point, and means of causing said reproducer-point to follow the record, of means of raising said reproducer-point clear of the record, independently of the reproducer-arm substantially as shown and described.

13. In a disk-phonograph the combination with a disk-table mounted on a rotating shaft,
65 a bracket mounted on said rotating shaft adapted to carry a plurality of disks, a plurality of disks therein, lugs on the bottom of said bracket to support the disks, and

means of automatically rotating said lugs at the completion of each record, to disengage
70 the said lugs from the disks and to drop same in place, substantially as shown and described.

14. In a disk-phonograph, the combination with a disk-table mounted on a rotating shaft,
75 a bracket mounted on said rotating shaft adapted to carry a plurality of disks; a plurality of disks carried thereby, said disks having beveled edges; lugs on the bottom of said bracket to support the disks, and means of automatically rotating said lugs at the completion of each record to drop a new record
80 into place, substantially as shown and described.

15. In a phonograph, the combination with a base-plate, a suitable frame thereon, a driving-shaft adapted to rotate in bearings in said
85 frame, means of rotating said shaft, a record-carrying-disk table, a segmental screw attached to said disk-table and slidably mounted on said shaft, a record-storage bracket carried on said shaft, and means of dropping
90 each record into place automatically upon the completion of the preceding record; of a pinion fastened to said driving-shaft, said pinion engaging with a gear engaging with a second gear fastened thereto, said second
95 gear having one tooth more than the gear to which it is attached and meshing with a second pinion rotatably mounted on the driving-pinion; said second pinion having a nut formed therein, which nut engages with the
100 segmental screw to lower the record-table, substantially as and for the purposes set forth.

16. In a phonograph, the combination with a base-plate, a suitable frame mounted thereon,
105 a driving-shaft journaled in said frame, a storage-bracket carried on the upper end of said shaft, a plurality of records carried in said record, and means of dropping successive records into place; of a record-carrying-disk table a segmental screw fastened to said disk-table and slidably mounted on said shaft, a nut rotatably mounted on said shaft and engaging said segmental screw, a differential gear for rotating said nut with reference
115 to said shaft, a segmental screw to lower the disk-table through the thickness of one record-disk, during the reproduction of a record; and means of throwing the differential gearing out of action, to permit the rapid
120 raising or lowering of the disk-table, substantially as shown and described.

17. In a phonograph, the combination with a base-plate, a suitable frame thereon, a driving-shaft journaled in said frame, a storage-
125 bracket carried on the upper end of said shaft, a plurality of records carried by said bracket, and means of dropping successive records into place, a record-carrying-disk table, a segmental screw fastened to said disk-table and slidably mounted on said shaft and engaging said segmental screw; a gear driving said nut, a second gear fastened to said driving-gear by a clutch, and a pinion on said driving-shaft

driving said second gear, of a fork adapted to raise said second gear to throw the clutch thereon out of engagement with the driving-gear; said fork being formed also as a brake to hold the driving-gear and the nut engaged therewith, so that the disk-table may be rapidly raised or lowered, substantially as shown and described.

18. In a disk-record phonograph, the combination with a driving-shaft, a bracket supported thereon carrying a plurality of record-disks and means of dropping each of these disks successively on the completion of the preceding record; of a segmental screw slidably mounted on said driving-shaft, a disk-table attached thereto, a nut with pinion thereon engaging said segmental screw said nut-pinion being rotated with reference to the said driving-shaft and segmental screw by means of differential gearing composed of a pinion rigidly fastened to said driving-shaft, a lower gear driven by said pinion, said lower gear having a clutch on its under face to engage with a clutch attached to an upper driving-gear which has one tooth more or less than the lower gear and the said driving-gear meshing with the said nut-pinion, and openings cut through the driving-pinion to permit the passage of the segmental screw, substantially as and for the purposes set forth.

19. In a disk-record phonograph, the combination with a driving-shaft, a bracket supported thereon carrying a plurality of record-disks, and means of dropping each one of these disks successively on the completion of the preceding record; a segmental screw slidably mounted on said driving-shaft, a disk-table attached thereto and a nut having a pinion thereon engaging said segmental screw said nut-pinion being rotated with reference to the said driving-shaft, a gear driven by said pinion, said driven gear having a clutch on its under face to engage with a clutch attached on a driving-gear having one tooth more or less than the driven gear, the said driving-gear meshing with the said nut-pinion, and openings cut through the driving-pinion to permit the passage of the segmental screw; of a fork adapted to raise the driven gear and the clutch thereon out of engagement with the clutch on the driving-gear, and to press against the clutch on the said driving-gear as a brake to hold the said gear and the nut-pinion meshing therewith, so that the segmental screw may be rapidly rotated thereon to raise or lower the disk-table, substantially as and for the purposes set forth.

20. In a phonograph, the combination with a rotating record-table and the record thereon, of a horizontally-swinging arm carrying a reproducer-point on the swinging end thereof, and means of causing the arm to swing outward from the center of the record-table and the record thereon and to follow a spiral record, said means consisting of an independent spiral, a directing-point to engage

with same connecting members to connect the point and the reproducer-arm and means of releasing said arm by tripping said directing-point out of the directing-spiral and at the same time tripping the reproducer-point clear of the record, and means of returning said swinging arm to the center of the record, substantially as and for the purposes set forth.

21. In a phonograph, the combination with a record-table, a record thereon, a horizontally-swinging reproducer-arm moving thereover, said arm carrying a record-reproducer, and means of causing said reproducer to follow the record, said means consisting of a rotatable gear with a spiral groove in the web thereof, means of rotating said gear, a swinging guiding-arm rigidly fastened through a vertical spindle to the reproducer-arm, a point on the end of said guiding-arm engaging with the spiral groove in the web of said rotating gear, and means of returning the said reproducer-arm to the center to begin a new record, substantially as shown and described.

22. In a phonograph, the combination of a record-table, a record thereon, means of operating said table, a horizontally-swinging reproducer-arm moving thereover, said arm carrying a reproducer, and means of causing said reproducer to follow the record, said means consisting of a rotating gear with a spiral groove in the web thereof and means of rotating said gear, a swinging guiding-arm rigidly fastened through a vertical spindle to the said reproducer-arm, a point on the end of said guiding-arm engaging with the spiral groove in the web of the rotating gear, a cam on the said gear to disengage the said point from the spiral groove and a coil-spring to bring the reproducer-arm back to the center when the point is disengaged substantially as shown and described.

23. In a phonograph, the combination with a record-table, a record thereon, a horizontally-swinging arm moving thereover, said arm carrying a record-reproducer, and means of causing said reproducer to follow the record, consisting of a rotating gear with a spiral groove in the web thereof, and means of rotating said gear, a swinging guiding-arm rigidly fastened through a vertical spindle to said reproducer-arm, and a point on the end of said guiding-arm engaging with the spiral groove in the web of the rotating gear, means of raising the reproducer-point clear of the record, means of disengaging the said point from the spiral groove, and means of returning the reproducer-arm to the point of beginning said means consisting of a coil-spring attached to the vertical spindle and the base-plate, substantially as shown and described.

24. In a phonograph, the combination with a record-table, a record thereon, a horizontally-swinging reproducer-arm moving thereover, said arm carrying a record-reproducer, a vertical spindle, a swinging guiding-arm

rigidly fastened through the said vertical spindle to said reproducer-arm, a rotatable gear with a spiral groove in the web thereof; means of rotating said gear, a point on the end of said guiding-arm engaging with the spiral groove in the web of the said rotating gear, means of raising said reproducer-point clear of the record, consisting of a cam on the said gear; a knee on the said guiding-arm, connected by a cord and bell-crank levers to a tension-weight which carries the reproducer-point, the said tension-weight, a lever mounted therein having a reproducer-point on one end thereof, and being connected at its opposite ends by means of a cord to a diaphragm; the said diaphragm, means of disengaging the guiding-point from the groove in the rotating gear, consisting of a cam on the said rotating gear, to engage with the knee which carries the guiding-point, all substantially as and for the purposes set forth.

25. In a phonograph, the combination with a rotating record-table, a horizontally-swinging reproducer-arm, a bracket on the end of said arm, a tension-weight mounted in said bracket, said tension-weight carrying a reproducer-lever, having a reproducing-point on one end thereof, and the opposite end thereof connected by means of a cord with a diaphragm, and the said diaphragm; means of causing said reproducer-point to follow the record, and means of raising said reproducer-point clear of the record, substantially as shown and described.

26. In a phonograph, the combination with a rotating record-table, a horizontally-swinging reproducer-arm, a bracket on the end of said arm, a tension-weight mounted in said bracket, said tension-weight carrying a lever, having a reproducing-point on one end thereof, and the opposite end thereof connected by means of a cord with a diaphragm, and the said diaphragm; means of causing said reproducer-point to follow the record, and means of raising said reproducer-point clear of the record, consisting of a cam on a rotating gear, a knee to engage with said cam, and cords connecting the said knee through bell-cranks with a bell-crank on the end of said tension-weight, substantially as shown and described.

27. In a phonograph, the combination with a record-table, a record thereon, a horizontally-swinging reproducer-arm moving thereover, said arm carrying a record-reproducer and means of causing said reproducer to follow the record, consisting of a vertical spindle a swinging guiding-arm rigidly fastened

through the vertical spindle to said reproducer-arm, a rotatable gear with a spiral groove in the web thereof, and means of rotating said gear, and a point on the end of said guiding-arm engaging with a spiral groove in the web of the said rotating gear, of means of raising said reproducer-point from the record, means of causing the said reproducer-arm to return to the center of the record to begin a new reproduction; and means of holding said reproducer-point away from the record, during this returning movement; said means consisting of a knee on the end of the said guiding-arm, a cam on said rotating gear to engage said knee and raise the reproducer-point, a spring fastened to said guiding-arm, adapted to engage with a lug on said knee and hold said knee until the spring shall have disengaged therefrom, and a coil-spring fastened to said vertical spindle and to the base-plate, all substantially as shown and described.

28. In a phonograph, the combination with a rotating record-surface, a horizontally-swinging arm, a reproducer-point on the free end thereof, means of causing said point to follow a record on the said surface, said means consisting of a directing-spiral exterior to the said surface and a point guided by the said spiral and means of connecting the said point with the reproducing-point, substantially as shown and described.

29. In a phonograph, the combination with a record, a swinging reproducer-arm, a reproducer-point movably attached to said arm and means of causing said point to follow a record, of means of raising said point with reference to said reproducer-arm to disengage the said point from the record, substantially as shown and described.

30. In a phonograph the combination with a record and means of operating same, a swinging reproducer-arm and means of guiding same, of a reproducer-point so attached to the reproducer-arm that it has an independent motion at right angles to the plane of motion of the reproducer-arm, and means of controlling this motion to raise the point clear of the record substantially as and for the purposes set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JOHN D. BLAGDEN.

Witnesses:

T. D. YOUNG,
LEE THORNTON.

No. 671,513.

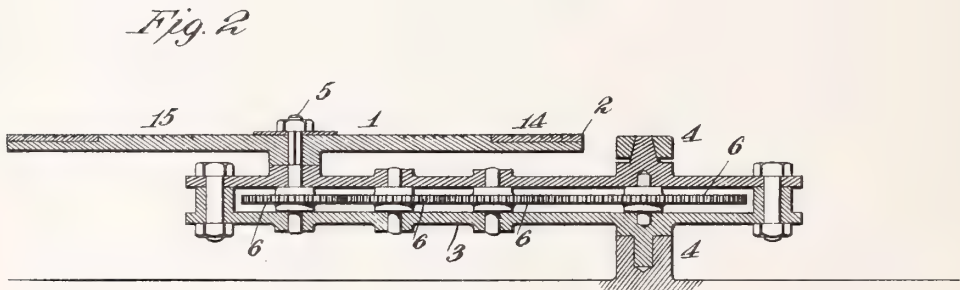
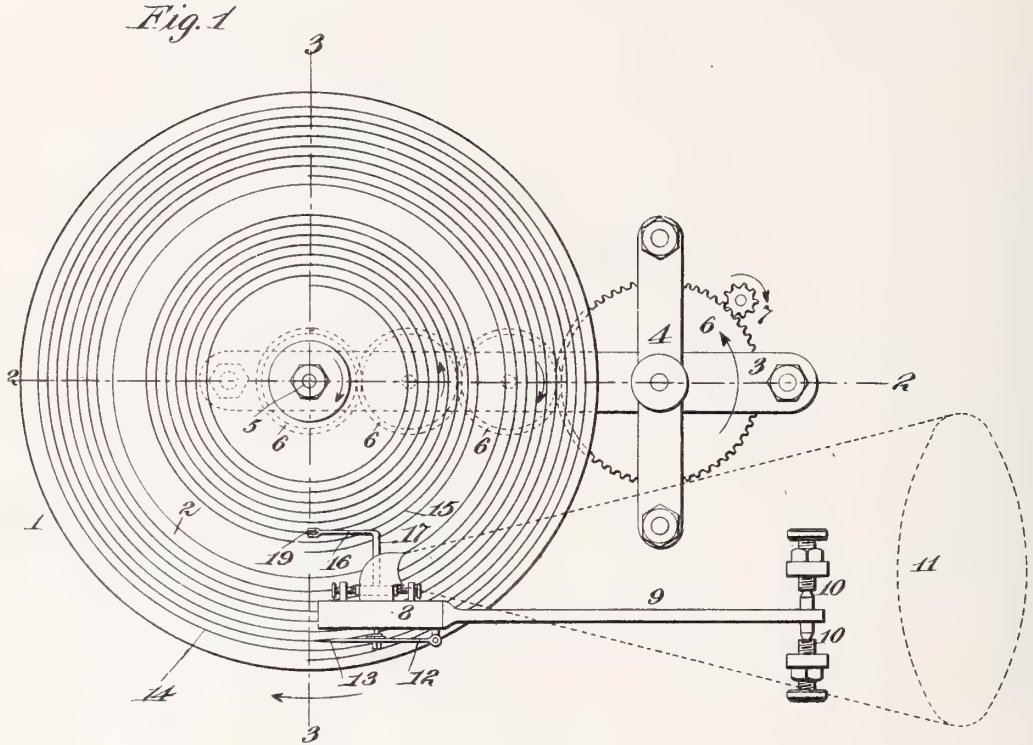
Patented Apr. 9, 1901.

F. D'A. GOOLD.
PHONOGRAPH.

(Application filed Jan. 18, 1899.)

(No Model.)

2 Sheets—Sheet 1.



Witnesses:

Jas. F. Coleman
John R. Gaylot.

O **Inventor**
Frederick A. A. Goold

by *Edmund A. Ayer*
Att'ys.



No. 671,513.

Patented Apr. 9, 1901.

F. D'A. GOOLD.
PHONOGRAPH.

(Application filed Jan. 18, 1899.)

(No Model.)

2 Sheets—Sheet 2.

Fig. 3

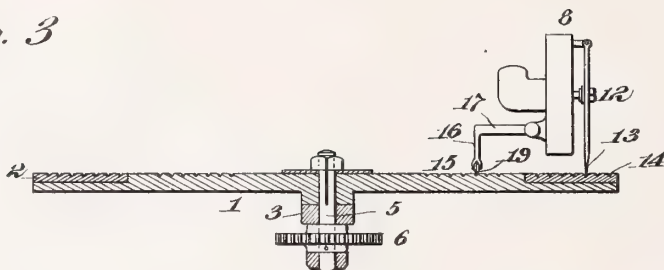
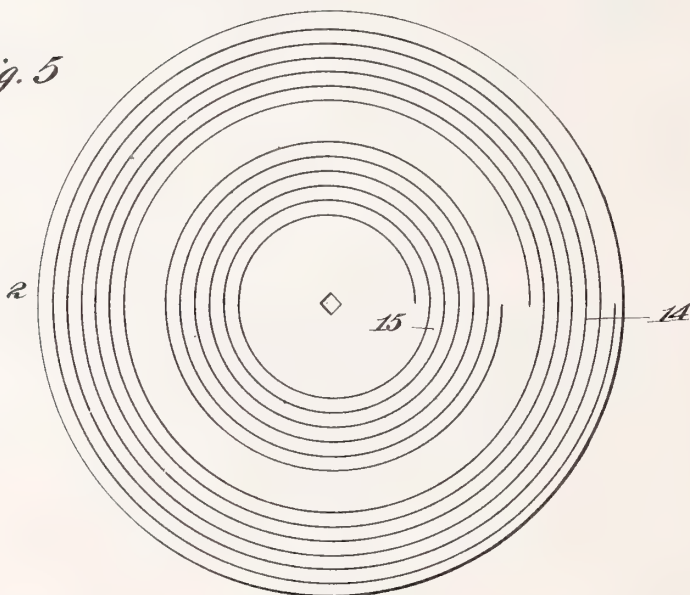


Fig. 4



Fig. 5



Witnesses:

Jas. F. Coleman
Jno. R. Taylor.

Inventor

Fredrick D'A. Goold
By H. J. Edwards, Atty.

UNITED STATES PATENT OFFICE.

FREDERICK D'ARTREY GOOLD, OF WORCESTER, MASSACHUSETTS.

PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 671,513, dated April 9, 1901.

Application filed January 18, 1899. Serial No. 702,537. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK D'ARTREY GOOLD, a citizen of the United States, residing at Worcester, in the county of Worcester and State of Massachusetts, have invented a certain new and useful Improvement in Talking-Machines, of which the following is a specification.

My invention relates to various new and useful improvements in talking-machines.

The object of the invention is to simplify the construction of such devices and to improve the operation thereof.

The invention also relates to improvements in sound-records for use in connection with the apparatus.

In carrying out my invention I provide a record-supporting platen or table, which is carried at the end of a swinging arm and on which the record-disk is placed. The record is formed in this disk as a sinuous volute spiral groove. Power is applied to the platen or table, whereby it will be rotated and at the same time will be free to swing on the pivot of the swinging sustaining-arm. Coöperating with the record is a suitable reproducing device held against movement in a plane parallel to the face of the record. This reproducing device is provided with a reproducing point or needle, which engages the record-groove and which is vibrated thereby in accordance with the sound vibrations. The engagement between the record-groove and the reproducing-point moves the record-disk with respect to the reproducing device, which movement is allowed by the mounting of the platen on the swinging arm, as explained. Instead of causing the engagement between the reproducing point or needle and the record to move the record-disk with respect to the reproducing device the said record-disk may be fed positively, as will be explained. The reproducing device is mounted so as to be movable in a plane at right angles to the face of the record-disk, so as to accommodate any eccentricities or variations in said disk. Preferably the record-disk is driven by a system of gears carried in the swinging sustaining-arm and so arranged that the driving stress thereof will tend to move the record-disk in the direction with respect to the reproducing device which it would take to cause the re-

producing-needle to engage with the entire record. When the movement of the record-disk is controlled or effected by the engagement between the reproducing-point and the record-groove, this particular way of driving the record-disk is advantageous, as it results in less wear between the record-groove and the reproducing-point. The same is also true when a positive-feed device is used, since when the record-disk is driven in this way the positive-feed device acts practically as a controlling mechanism. It will be possible to so proportion the parts that the tendency of the driving-gears to rotate the disk and to move the disk relatively to the reproducing device will exactly overcome the resistance to the rotation and movement of the disk, so that the only wear which will be imposed upon the record-groove (when the feed is effected thereby) or upon the positive-feed mechanism will be that due, respectively, to the simple engagement of the reproducing point or needle with the record-groove or to the engagement together of the elements comprising the positive-feed device. In some instances a positive-feed device or a positive-feed-controlling device may be advantageous. The preferable form of positive-feed or positive-feed-controlling device which I use comprises a volute spiral groove arranged parallel with the record, either within it or surrounding it. I engage with the feed-groove thus formed a controlling-point, which is connected with the reproducing device, which controlling-point will obviously so move the reproducing device as to cause the reproducing point or needle to engage accurately with the record-groove. The feed-groove thus formed may be produced in the platen or table which carries the record-disk; but in this case care will have to be taken to so arrange the record-disk on the platen or table as to effect the desired accurate parallelism of the record and feed grooves. In order to overcome the necessity of this accurate adjustment, I prefer to form the feed-groove when used directly on the record-disk, which feed-groove will be produced thereon at the same time that the record-groove is made in the manner to be presently explained. When this is done, any eccentricities or variations in the record-groove will be reproduced in the feed-groove and the two grooves

will be always parallel, so that an absolutely-accurate feeding operation or a feed-control will be effected.

In order that my invention may be better understood, attention is directed to the accompanying drawings, forming a part of this specification, and in which—

Figure 1 represents a plan view of so much of my talking-machine as is necessary to enable a clear understanding of the invention to be comprehended; Fig. 2, a section on the line 2 2 of Fig. 1; Fig. 3, a section on the line 3 3 of Fig. 1; Fig. 4, a separate diagrammatic view illustrating the improved record-disk and the manner of making the same, and Fig. 5 a plan view of such record-disk.

In all the above views corresponding parts are represented by the same numerals of reference.

1 represents a disk-shaped platen or table on which the record 2 is carried. In Figs. 1, 2, and 3 I illustrate this record as being in the form of a flat ring carrying the volute spiral record-groove on its upper surface. The table 1 is carried on a swinging arm 3, pivoted at one end—as, for instance, in the bearings 4, 4—whereby the platen or table will be free to swing concentrically with the pivot of said arm. The platen or table is driven in any suitable way and by any appropriate mechanism. I illustrate said platen or table as being mounted on a shaft 5 in the swinging arm 3 and as being driven by a series of gears 6 6 6, carried in said arm, the last-mentioned gear being mounted concentrically with the pivot of said arm. These gears are driven in any suitable way—as, for instance, by a motor-gear 7, connected to any suitable motive device, such as a spring-motor or an electric motor.

8 represents the reproducing device, which will be presently explained and toward which the platen or table is movable in order that the reproducing-needle may engage with the volute spiral record-groove. Preferably the gears 6 and 7 are so arranged that when rotated in the directions indicated by the arrows in Fig. 1 the driving stress will tend to move the platen or table toward the reproducing device. It will be possible by properly proportioning the parts to so adjust this tendency of the platen or table to be moved toward the reproducing device as to exactly counterbalance the resistance to such movement, so as to reduce wear on the feeding device, whether the latter is the reproducing device or a special feed-arm, as will be explained. The friction imposed by the bearing 4 to the radial turning of the arm 3 should therefore be sufficient to substantially counteract the radial movement of said arm under the stress of the driving-gearing—for instance, by employing a cone-bearing for the arm, as shown in Fig. 2, the friction of which may be adjusted by varying the pressure of the upper bearing-box on the bearing-pin.

The reproducing device is of any suitable and approved construction and is not illustrated in detail. It is carried on an arm 9, so arranged as to be movable in a plane at right angles to the movement of the platen or table, so as to accommodate any eccentricities or variations of the blank 2. For this purpose the arm 9 may be mounted between the bearings 10 10, as shown. The reproducing device carries the usual horn 11, (shown in dotted lines, Fig. 1,) through which the reproduction becomes audible. It is also provided with the usual reproducing-arm 12, connected with a diaphragm (not shown) and having a reproducing point or stylus at its lower end. This reproducing point or stylus trails in the sinuous volute spiral record-groove 14, formed in the record-disk 2, vibrating the reproducing-arm 12 and the diaphragm and reproducing the original sound. It will be possible and in some instances desirable, owing to its simplicity, to effect the feed of the record-disk relatively to the reproducing device by the engagement between the needle or stylus 13 and the volute spiral groove. By so proportioning the driving-gears as to cause the driving stress to move the record-disks toward the reproducing device the reproducing needle or stylus 13 acts practically as a controlling device, allowing the record-disk to be moved relatively to the reproducing device to maintain the reproducing point or stylus in engagement with the volute spiral record. If the driving stress is not sufficient to move the platen or table toward the reproducing device the reproducing point or stylus effects a positive movement of such disk; but there will be manifestly less wear between the record groove and the stylus than if there were no tendency on the part of the driving mechanism to so move the platen or table. I consider this an important feature of my invention.

In some instances a positive-feed device may be used, and this preferably comprises a volute spiral feed-groove 15, arranged parallel with the record-groove. I show this groove as being inclosed by the record-groove; but it obviously may inclose the latter. In Figs. 1, 2, and 3 I show the feed-groove 15 as being formed on the upper surface of the table or platen 1, and I engage with said groove a feed-stylus 16, carried on an arm 17, pivoted to the reproducing device 8. Preferably the feed-stylus is provided with a small antifric-tion-roller 19, which engages directly with the feed-groove. It will be obvious that when the record table or platen is turned the engagement between the feed-stylus 16 and the feed-groove will shift the disk with respect to the reproducing device, allowing the reproducing point or stylus to trail accurately in the record-groove. The advantage of this construction (in positive-feed talking-machines) is that wear on the record-disk is overcome. It is obvious, however, that care must be taken to so

place the record-disk on the platen or table as to have the two grooves 14 and 15 exactly parallel. In order that this objection may be overcome, I prefer to form the feed-groove directly on the record-disk, as illustrated in Figs. 4 and 5, because by doing so the feed-groove and record-groove may be produced simultaneously, so that any eccentricities or variations in one will be reproduced in the other.

In making a record, therefore, I prefer to connect the recording-point 18 (see Fig. 4) with a cutting-point 19, engaging the record-disk within the record-groove. In making these records the disk will be rotated in any suitable recording device, the recording-point 18 forming the record-groove and the point 19 forming the feed-groove. In this way the two grooves will be made absolutely parallel. It will be understood that with a record-disk such as illustrated in Fig. 4 the reproduction can be effected directly from the original record or that the latter, including the feed-groove, may be reproduced by any suitable process for the reproduction of such record.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is as follows:

1. In a talking-machine, the combination with a rotatable flat record movable horizontally and having a sinuous volute spiral record-groove therein, of a horizontally freely movable support for said record, means for so rotating said record that horizontally it will be maintained in substantial balance, and a reproducing device engaging the record-groove and held against horizontal movement, substantially as set forth.

2. In a talking-machine, the combination with a rotatable flat record swinging horizontally and having a sinuous volute spiral record-groove therein, of a support for said record, a freely-movable swinging arm carrying said support, means for so rotating said support as to substantially balance its tendency to swing horizontally, and a reproducing device engaging the record-groove and held

against horizontal movement, substantially as set forth.

3. In a talking-machine, the combination with a rotatable flat record having a sinuous volute spiral record-groove therein, of a rotatable platen carrying said record, a freely-movable swinging arm sustaining said platen, a system of gears carried by said swinging arm for driving the platen and maintaining the arm in substantial balance, means for operating said gears, and a reproducing device engaging the record-groove and held against horizontal movement, substantially as set forth.

4. In a talking-machine, the combination with a rotatable flat record having a sinuous volute spiral record-groove therein, of a rotatable platen carrying said record, a freely-movable swinging arm sustaining said platen, means for rotating the platen and for maintaining the arm in substantial balance, a reproducing device engaging the record-groove, and a hinge for said reproducing device allowing movement thereof in a plane at right angles to the horizontal swinging movement of said platen, substantially as set forth.

5. In a talking-machine, the combination with a rotatable flat record movable horizontally and having a sinuous volute spiral record-groove therein, of a horizontally freely movable support for said record, means for so rotating said record that horizontally it will be maintained in substantial balance, a reproducing device engaging the record-groove and held against horizontal movement, a feed-groove arranged parallel with the record-groove, and a device carried by the reproducing device for engaging the feed-groove, substantially as set forth.

This specification signed and witnessed this 10th day of January, 1899.

FREDERICK D'ARTREY GOULD.

Witnesses:

JNO. R. TAYLOR,
FRANK L. DYER.

No. 671,625.

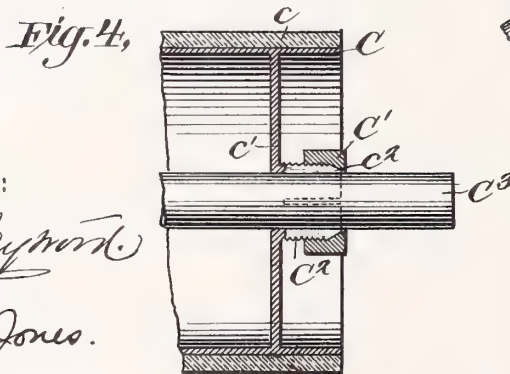
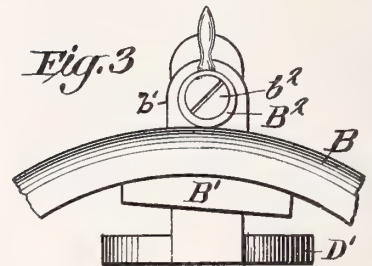
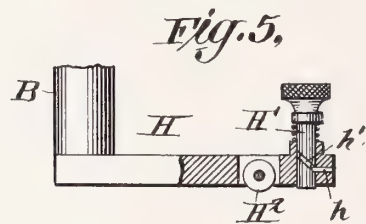
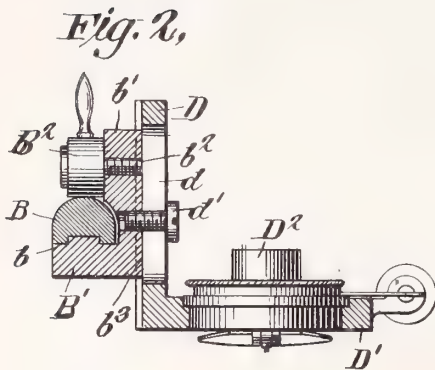
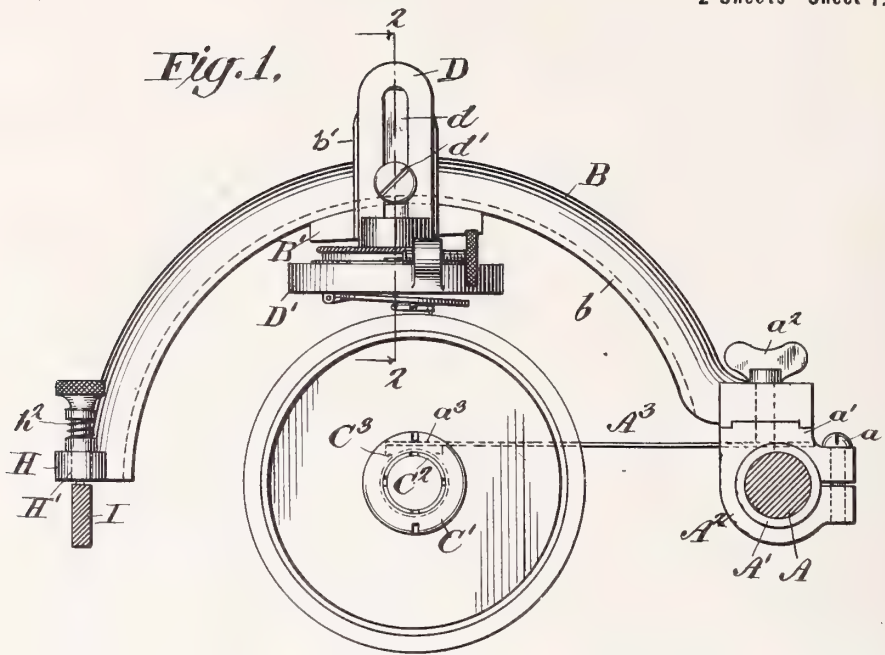
E. A. HAWTHORNE.
PHONOGRAPH.

Patented Apr. 9, 1901.

(Application filed Jan. 18, 1900.)

(No Model.)

2 Sheets—Sheet 1.



WITNESSES:

E. A. Hawthorne
Charles S. Jones.

INVENTOR

Edwin A. Hawthorne
BY *Edwin H. Brown*

ATTORNEY

No. 671,625.

E. A. HAWTHORNE.
PHONOGRAPH.

Patented Apr. 9, 1901.

(Application filed Jan. 18, 1900.)

(No Model.)

2 Sheets—Sheet 2.

Fig. 6.

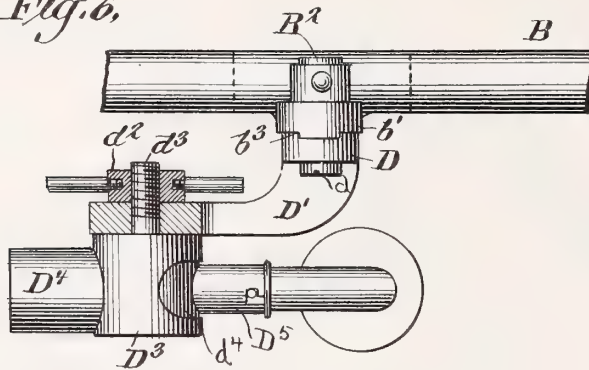
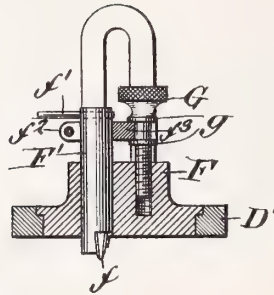


Fig. 7.



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Charles S. Jones.

INVENTOR

Ellsworth A. Hawthorne

BY *Edwin H. Brown*

ATTORNEY

UNITED STATES PATENT OFFICE.

ELLSWORTH A. HAWTHORNE, OF MONTCLAIR, NEW JERSEY.

PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 671,625, dated April 9, 1901.

Application filed January 18, 1900. Serial No. 1,857. (No model.)

To all whom it may concern:

Be it known that I, ELLSWORTH A. HAWTHORNE, a citizen of the United States of America, residing in Montclair, Essex county, New Jersey, have invented certain new and useful Improvements in Phonographs, of which the following is a specification.

My invention relates to phonographs, graphophones, and similar machines, the object being to secure certain adjustments of the recorder, reproducer, and shaving-knife relatively to the phonogram-blank or the sound-record cylinder.

I will describe a machine embodying my improvements and point out the novel features thereof in the claims.

To carry out the object of my invention, I have devised the means illustrated in the accompanying drawings, in which—

Figure 1 is a side elevation of a diaphragm-supporting arm and its adjuncts. Fig. 2 is a vertical section on the plane of the line 2 2 of Fig. 1, certain of the parts being shown in elevation. Fig. 3 is a view in elevation of a portion of the diaphragm-supporting arm on the side opposite that shown in Fig. 1. Fig. 4 is a sectional view of the mandrel that carries the sound-record. Fig. 5 is a view, part in section and part in elevation, of a bracket on the diaphragm-supporting arm and a stud for raising and lowering the latter. Fig. 6 is a plan view of the diaphragm-supporting arm and bracket. Fig. 7 is a view of my improved knife adapted to be used in connection with the diaphragm-supporting arm.

In the drawings, in which similar letters of reference indicate similar parts, A designates the back rod, and A' the back-rod sleeve, movable along said rod, as found in well-known machines, to which my improvement relates. A² designates a split collar or ring clamped to the said sleeve by means of a screw a. The upper face of the collar A² is provided with a seat a' to receive the end of the diaphragm-supporting arm B, the contacting faces being dovetailed to provide a fixed seat. The sleeve A' and its attached parts are caused to travel along the rod A by means of the twin nut a³, traveling upon the screw-threaded drive-shaft C³, and the arm A³, connected to said nut and also to the sleeve A', this construction being one commonly used in machines of this class.

The arm B, which carries a bracket adapted to support a recorder, reproducer, or shaving-knife, is curved on the arc of a circle, so as to be concentric with the sound-record cylinder. This arm is clamped at its rear end to the collar A² by means of a screw a², and at its forward end is formed into a bracket H, to be hereinafter described. This arm B is provided upon its under face with a grooved way or track b, adapted to receive a slide-block B', which block has an upwardly-extending portion b', in which is seated a stud b². On this stud is mounted a cam-lever B², which bears upon the upper face of the arm B and firmly locks the slide-block B' to said arm. By adjusting the cam-lever the slide-block B' may be moved to any part of the arm B and then clamped securely in position thereon. The inner face of the upwardly-extending part b' will preferably be formed with a suitable guideway b³, and mounted so as to be adjustable along said way is a block D, which forms an integral part or has secured to it a bracket D', which bracket is adapted to receive a recorder D² or a reproducer or a shaving-knife of any approved construction. The block D is slotted, as shown at d, so that it may be adjusted to any position along the part b' of the slide-block B' by means of a clamp-screw d', having a seat in the block B'.

It is evident from the construction that whatever may be the diameter of the sound-record cylinder the recorder, reproducer, or shaving-knife carried by the bracket D' may be adjusted radially of said cylinder to accommodate any one of said devices to a cylinder of greater or less diameter. Thus if the machine has been in use with a phonogram or cylinder of small diameter and it is desired to use one of greater diameter or one that is commonly known as "concert size" the recorder, reproducer, or shaving-knife may be adjusted radially outward to accommodate said device to the larger phonogram or cylinder. Of course a reverse adjustment may be used when changing from a large to a smaller phonogram or cylinder. It will also be seen that according to the construction above described the recorder, reproducer, or shaving-knife may be adjusted lengthwise of the arm B, according to the character of the record to be made or reproduced. For ex-

ample, if a light engraving of the sound-recorder is required a better result is obtained by placing the recorder substantially in the position shown in Fig. 1, and the reproducer should occupy the same position when it is in use. If a heavy engraving is required, such as a record of a band, it is better to place the recorder at the right-hand end of arm B or at the back of the phonogram-blank, as in such position the limiting-weight or the weight of the diaphragm bears heavier on the recording-stylus, and hence a deeper cut will be made.

With the heavy engraving the reproducer may be thrown to the back of the phonogram, and thus the angle best suited to a proper reproduction secured. Again, it may be found desirable to place the recorder or reproducer at the front of the cylinder for certain records. With the present form of adjustment it is possible by moving the recorder or reproducer along the arm B to ascertain precisely the position of the said devices or either of them best suited to the work required.

In Figs. 1 and 4 I have shown a form of mandrel that permits of a ready change in the size required or desired for use. In this form C designates a mandrel adapted to receive the sound record or cylinder *c*. The mandrel is provided near one end with a diaphragm *c'*, having a central opening in which is seated the base or flange of a split collar *C*². The sections of the collar *C*² are screw-threaded and tapered at their outer ends. When placed upon the main driving-shaft *C*³, the collar, and consequently the mandrel, may be secured to said shaft by means of a clamp-nut *C'*, having an inclined shoulder *c*², engaging the tapered ends of the collar-sections, and thus drawing the collar firmly down upon the shaft. Of course any other means, such as any well-known clutch mechanism, may be employed to secure the mandrel to the shaft, the only consideration being that whatever means shall be employed shall permit of easy and ready adjustment, so that a mandrel of any given size may be placed upon the main driving-shaft without difficulty.

In Fig. 6 the adjustable bracket *D'* is shown as supporting, by means of a stud *d*³, a tubular body *D*³. This tubular body has attached thereto the horn connection *D*⁴, and also carries the diaphragm connection-tube *D*⁵, to which is attached a form of recorder commonly employed on graphophone-machines. This connection *D*⁵ has its inner end in the form of a plate curved to fit and bear against the inner wall of the body *D*³, forming a socket connection. The outer end of the stud *d*³ is screw-threaded, and a clamp-nut *d*² mounted thereon permits the adjustment at any desired angle of elevation of the horn connection independently of the recorder or reproducer, even while the record is being made or reproduced. The wall of the tubular body is cut away, as shown at

*d*⁴, so as to permit free movement of the horn connection independently of the diaphragm to the extent of the portion cut away. With this form of attachment, in connection with the radially-adjustable devices heretofore described, it is possible to adjust the position of the recording-stylus at any given point on the phonogram-blank to bring the recording-point into operation to make cuts of different degrees. This may be done by first adjusting the diaphragm connection by means of the nut *d*² and screw *d*³, so as to throw the recorder off the blank and then bring the recording-point into a different angular position at the same point on the phonogram-blank by means of the adjustable block or bracket *D*. In this manner the recording-point may be given any angular position with relation to the phonogram-blank, so that a cut of any desired character may be made.

The means just described for adjusting the horn connection and recorder are secured to the adjustable bracket *D'*, and the sound-box adjustment (shown in Fig. 6) is capable of the adjustments heretofore described lengthwise of the arm B and radially of the sound-record cylinder.

In Fig. 7 I have shown a novel form of shaving-knife. It consists, essentially, of a body portion *F*, adapted to be seated in the bracket *D'*. Passing vertically through an opening in the body *F* is a post *F'*, which carries at its lower end a knife or cutter *f* and at its upper end a suitable handle *f'*, by means of which the post may be rotated, and thus the knife-edge adjusted so as to cut a narrow or wide strip from the periphery of the sound-record cylinder. The body *F* is also provided with a screw-threaded recess to receive a screw *G*, which is provided near its upper end with collars or rings *g*. Between these rings are the arms *f*³, forming part of a collar *f*², clamped to the post *F'*. By these means the post *F'* and the knife carried by it may be adjusted radially of the sound-record cylinder to give a light or heavy cut.

The front portion of the arm B is formed into a bracket *H*, which carries the roller *H*², adapted to travel upon the edge *I*, forming part of the frame or body of the machine. This construction materially reduces the friction of the arm B on the traveling way *I*. In order to lift the arm B, and consequently the recorder, reproducer, or shaving-knife, from the periphery of the sound-record cylinder, I provide a very simple means in the pin *h*, seated in the bracket *H* and projecting into a slot *h'* on the stud *H'*, set into an opening in said bracket. A spring *h*², surrounding said stud and bearing against the bracket *H*, tends normally to hold the roller in contact with the edge *I*. By turning the stud *H'* the arm B will be lifted, and the part held by the bracket *D* will be clear of the cylinder.

Having now particularly described and ascertained the nature of my invention and in

what manner the same is to be performed, I declare that what I claim is—

1. An attachment for use on phonographs and graphophones, comprising a bracket to support a recorder, reproducer or shaving-knife, an arm to which said bracket is adjustably secured, and means to adjust said bracket, together with the recorder, reproducer or shaving-knife when attached to the machine, relatively to said arm in a straight line in the direction of the radius of the sound-record cylinder, whereby said devices may be adjusted to accommodate cylinders of different diameters on the same machine, substantially as described.

2. In a phonograph or graphophone, comprising a sound-record cylinder, an arm resting on the frame of the machine, a bracket to support a recorder, reproducer or shaving-knife, means to adjust said bracket with the recorder, reproducer or shaving-knife relatively to said arm in a straight line in the direction of the radius of the cylinder, whereby said devices may be adjusted to accommodate cylinders of different diameters on the same machine, substantially as described.

3. In a phonograph or graphophone comprising a sound-record cylinder the combination of a curved arm mounted concentrically of the sound-record cylinder, a bracket on said arm adapted to support a recorder, reproducer or shaving-knife, means to adjust said bracket lengthwise of said arm and means to adjust said bracket radially of said arm, substantially as and for the purpose described.

4. In a phonograph or graphophone, comprising a sound-record cylinder, the combination of a curved arm attached to the back-rod sleeve of the machine concentrically of said cylinder, a block mounted on and adjustable lengthwise of said arm, a bracket, to support a recorder, reproducer or shaving-knife, adjustably secured to said block, and means to adjust said bracket together with the recorder, reproducer or shaving-knife in a straight line in the direction of the radius of the cylinder, substantially as described.

5. In a phonograph or graphophone com-

prising a sound-record cylinder, an arm supported on the frame of the machine and embracing the sound-record cylinder, a recording, reproducing or shaving device supported on said arm, and means to adjust said devices lengthwise of said arm, substantially as described.

6. In a phonograph or graphophone, comprising a sound-record cylinder the combination of a curved arm, mounted on the frame of the machine concentric with the sound-record cylinder, a bracket mounted on said arm and adjustable lengthwise thereof, a recorder, reproducer or shaving-knife supported by said bracket, and a cam-lever secured to said bracket and bearing upon the said arm, to lock the said bracket to the said arm in any desired position.

7. A shaving-knife adapted to be used with phonographs or graphophones, consisting of a body portion, a knife-carrying arm, and means to adjust said arm and knife at any desired angle, to change the width of the cut.

8. In a phonograph or graphophone, comprising a sound-record cylinder and a recorder or reproducer, an arm attached to the back-rod sleeve of the machine, a bracket to support said recorder or reproducer adjustably mounted on said arm, a horn connection for the recorder or reproducer also mounted on said bracket and means to adjust said horn connection independently of the recorder or reproducer.

9. In a phonograph or graphophone, comprising a sound-record cylinder, an arm secured to the back-rod sleeve, a bracket mounted on said arm and adjustable thereon radially of the sound-record cylinder, a recorder supported by said bracket and means to adjust said recorder to any desired angular position relatively to the sound-record cylinder, to make any desired character of cut.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ELLSWORTH A. HAWTHORNE.

Witnesses:

GEO. E. CRUSE,

CHARLES S. JONES.

N. JENSEN.
POLYPHONE ATTACHMENT.

(Application filed Sept. 14, 1900.)

(No Model.)

Fig. 1.

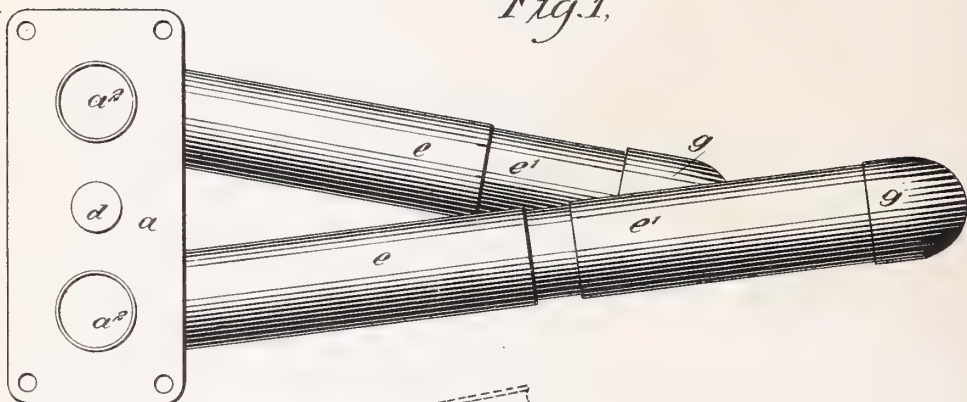


Fig. 2.

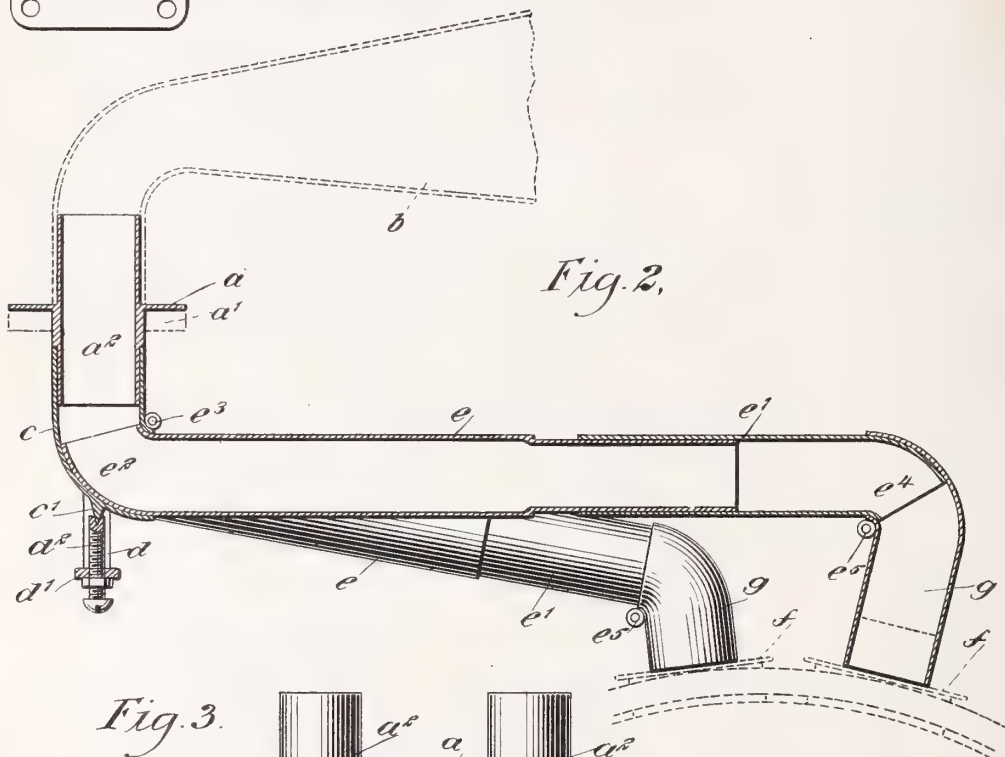
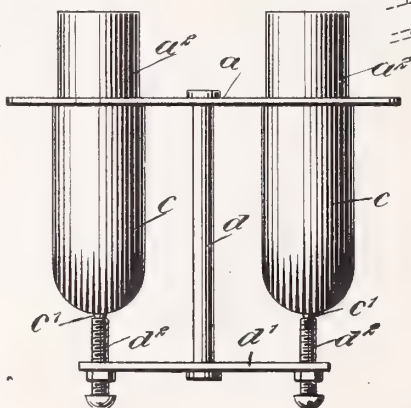


Fig. 3.



WITNESSES:

Edw. Thorpe
J. B. Owens.

INVENTOR

Newman Jensen.

BY

M. J. Jensen

ATTORNEYS

UNITED STATES PATENT OFFICE.

NEWMAN JENSEN, OF EUREKA, CALIFORNIA.

POLYPHONE ATTACHMENT.

SPECIFICATION forming part of Letters Patent No. 671,800, dated April 9, 1901.

Application filed September 14, 1900. Serial No. 30,006. (No model.)

To all whom it may concern:

Be it known that I, NEWMAN JENSEN, a citizen of the United States, and a resident of Eureka, in the county of Humboldt and State of California, have invented a new and Improved Polyphone Attachment, of which the following is a full, clear, and exact description.

This invention relates to certain improvements in means for conveying the sound-waves from the reproducers of polyphone and other sound-reproducing apparatus to the horns, to which end the invention consists in certain peculiar features of construction and arrangements of parts, which will be fully described hereinafter and defined in the claims.

This specification is the disclosure of one form of the invention, while the claims define the actual scope thereof.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the views.

Figure 1 is a plan view of the invention. Fig. 2 is a sectional elevation indicating the position of the invention with respect to the adjacent device, and Fig. 3 is a rear elevation of the invention.

A main or body portion in the form of a plate a is provided, which is adapted to be fastened to any suitable stationary support, (indicated by the dotted lines a' in Fig. 2.) This plate a has two tubes a^2 passing there-through. These tubes are here shown as integral with the plate a , and this is a preferred construction. It is obvious, however, that the tubes a^2 could be made separate from the plate a and fastened thereto. The tubes a^2 carry the horns at their upper ends, as indicated by the dotted lines b in Fig. 2. The lower end of each tube a^2 has an elbow-tube c fitted loosely thereon, so as to be capable of turning around the tube. These elbows c are supported by a rod d , suspended from the plate a , which rod carries at its lower end a cross-piece d' , the ends of which receive screws d^2 , standing vertically and having their upper ends formed with recesses, in which are pivotally fitted projections c' on the elbows c . The screws d^2 and the projections c' of each elbow-tube c are arranged coinci-

dent with the longitudinal axis of the corresponding tube a^2 , so as to sustain the elbow-tubes c , permitting them to turn freely around such axis. To each elbow-tube c is connected a telescopic tube comprising sections e and e' , the section e being adjacent to the elbow c and having an elbow-like end e^2 thereon, which fits into the elbow c and is joined thereby by a pivot e^3 , thus enabling the telescopic tube $e e'$ to swing on the elbow c , it being understood that the end e^2 and the elbow c are projected past each other, so that the telescopic tube may swing freely around the hinge e^3 without breaking the contiguity of the sound-conduit formed by the parts c and e .

The reproducers of the polyphone (indicated by the dotted lines f in Fig. 2) are respectively connected with elbow-tubes g , the upper or elbowed ends thereof respectively receiving the elbowed ends e^4 of the sections e' of the telescopic tubes, the parts g and e' being joined to each other by hinges or pivots e^5 , similar to the pivots e^3 , hereinbefore referred to. This connection between the parts e' and g is similar to that between the parts e and c , it being understood that the positions of the pivots e^5 and e^3 are reversed, or, in other words, the elbows c project up from the telescopic tube and the elbows g project down therefrom.

By this construction a continuous and unbroken sound-conduit is formed from the reproducers to the horns, and, further, the reproducers are permitted to move freely over the record, the various parts c , e , e' , and g permitting this free movement of the reproducers without interfering with the contiguity of the sound-conduit formed by the said parts. The parts e , e' , and g may swing with the elbows c around the axes of the screws d^2 . The sections e' of the telescopic tubes and the elbows g may have turning movement around the axes of the sections e of the telescopic tubes, and, lastly, the elbows g may move on the ends e^4 of the sections e' and the telescopic tubes, with the elbows g , may swing independently on the elbows c .

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. An attachment for polyphone or other sound-reproducing apparatus, comprising a telescopic tube, and an elbow-tube at each end of the telescopic tube, the elbow-tubes being
5 hingedly mounted on the telescopic tube and the telescopic tube having elbowed portions respectively working with the elbow-tubes.

2. An attachment for polyphones or other sound-reproducing apparatus, comprising two
10 tubes having elbowed portions fitting loosely the one within the other, such tubes being hingedly or pivotally connected to permit their adjustment, for the purpose specified.

3. An attachment for polyphones or other
15 sound-reproducing apparatus, comprising a stationary tube, an elbow-tube arranged to turn around the same, a supporting device for the elbow-tube, such device comprising a pivot-bearing coincident with the axis of the
20 turning of the elbow-tube, and an additional tube having connection with the elbow-tube.

4. An attachment for polyphone or other sound-reproducing apparatus, having an elbow-tube mounted to turn, a supporting device
25 for the elbow-tube, comprising a pivot coincident with the axis of the turning of the

elbow-tube, and an additional tube in communication with the elbow-tube.

5. An attachment for polyphone or other sound-reproducing apparatus, comprising a
30 stationary tube adapted to have connection with a member from which the sound is emitted to the atmosphere, an elbow-tube arranged to turn around the stationary tube, a supporting device for the elbow-tube, such sup-
35 porting device comprising a pivot-bearing coincident with the axis of the turning of the elbow-tube, a telescopic tube, one end of which has an elbow working with the said elbow-tube and hingedly connected thereto, and a second
40 elbow-tube hingedly connected with the other end of the telescopic tube, said end of the telescopic tube having an elbow working with the second elbow-tube.

In testimony whereof I have signed my
45 name to this specification in the presence of two subscribing witnesses.

NEWMAN JENSEN.

Witnesses:

E. P. CAMPBELL,

M. W. HEURIE.

No. 672,235.

Patented Apr. 16, 1901.

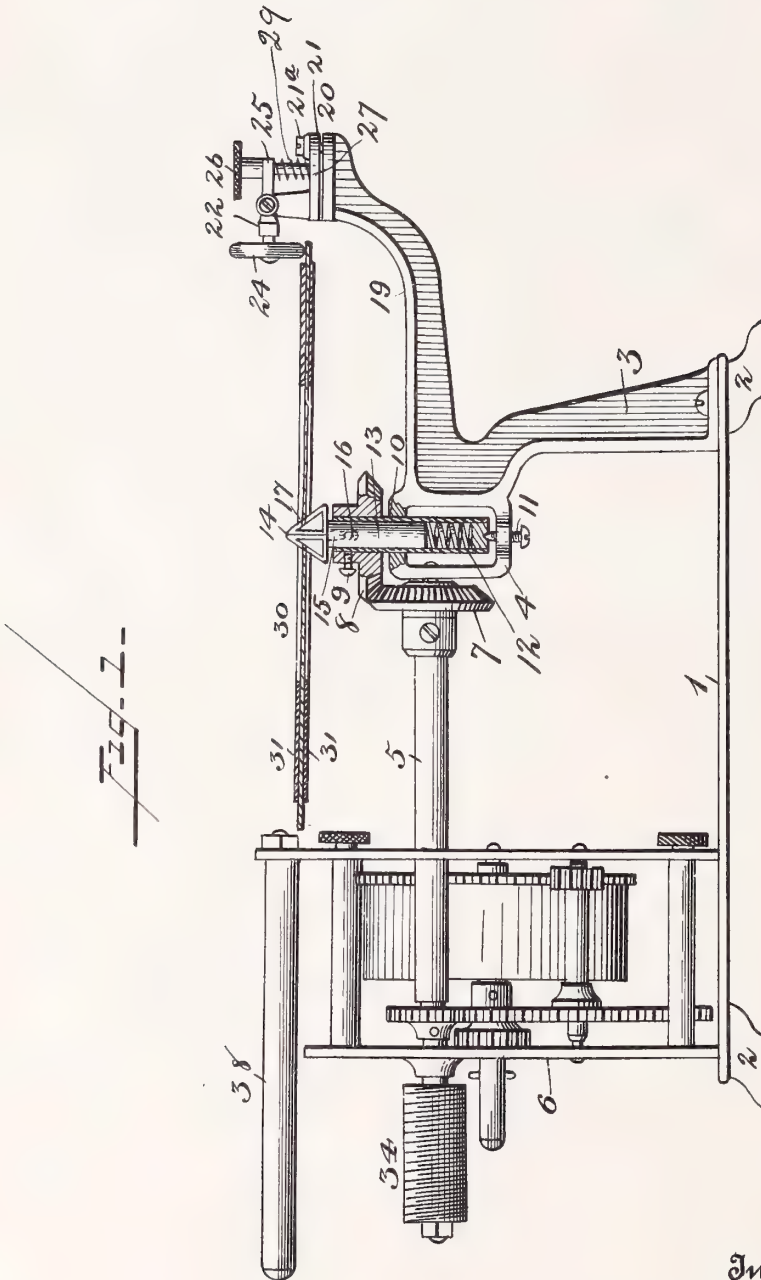
F. MYERS.

SOUND PRODUCING INSTRUMENT.

(No Model.)

(Application filed Jan. 9, 1901.)

3 Sheets—Sheet 1.



Witnesses
F. L. Ormand,
George J. Nika

Inventor
Frederick Myers
By E. R. Dunger,
his Attorney

No. 672,235.

Patented Apr. 16, 1901.

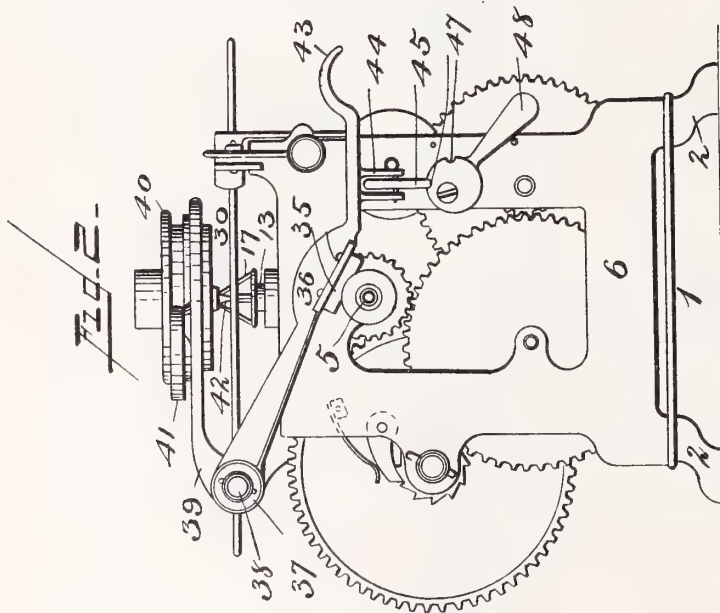
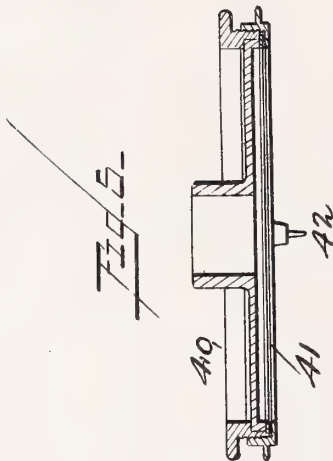
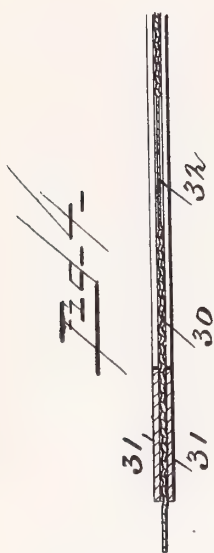
F. MYERS.

SOUND PRODUCING INSTRUMENT.

(No Model.)

(Application filed Jan. 9, 1901.)

3 Sheets—Sheet 2.



Witnesses
H. L. Curand
George J. Miller

Inventor
Frederick Myers
By E. P. Remyer,
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No. 672,235.

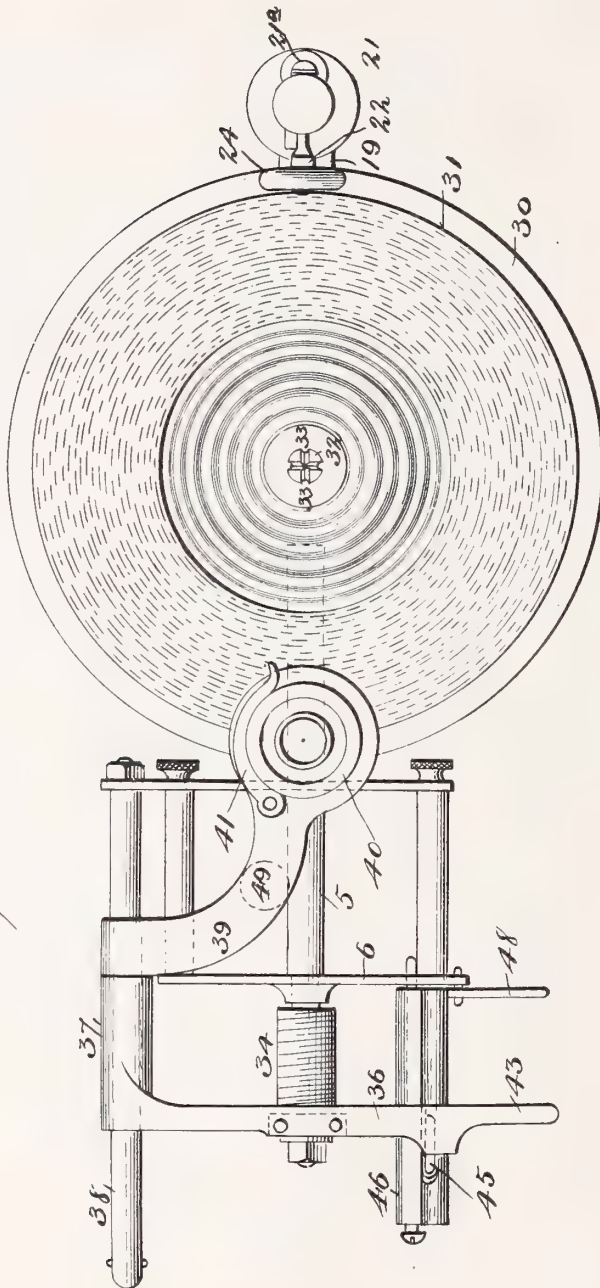
Patented Apr. 16, 1901.

F. MYERS.
SOUND PRODUCING INSTRUMENT.

(No Model.)

(Application filed Jan. 9, 1901.)

3 Sheets- Sheet 3.



Witnesses
F. L. Ourand.
Georg J. Hebe

Inventor
Frederick Myers
by E. R. Bunya,
his Attorney

UNITED STATES PATENT OFFICE.

FREDERICK MYERS, OF NEW YORK, N. Y., ASSIGNOR TO THE STYLOPHONE COMPANY, OF SAME PLACE.

SOUND-PRODUCING INSTRUMENT.

SPECIFICATION forming part of Letters Patent No. 672,235, dated April 16, 1901.

Application filed January 9, 1901. Serial No. 42,677. No model.

To all whom it may concern:

Be it known that I, FREDERICK MYERS, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented new and useful Improvements in Sound-Producing Instruments, of which the following is a specification.

My invention relates to sound-producing instruments of the phonograph type, and the principal object of the same is to provide simple and efficient means for giving a rotary and a vertical vibratory motion to the record-disk. In instruments which reproduce from the record-disk as at present in use the disk is rotated and the reproducer is mounted upon a pivoted arm, the stylus being free to follow the spiral grooves in the disk, and thus serving to carry the reproducer laterally across the face of the disk. The object referred to is attained by means of the construction illustrated in the accompanying drawings, in which—

Figure 1 is a front elevation of an instrument made in accordance with my invention. Fig. 2 is an end elevation of the same. Fig. 3 is a plan view. Fig. 4 is a sectional view of the record-disk. Fig. 5 is a central section through the sound-box.

Like numerals of reference designate like parts in the different views of the drawings. The numeral 1 designates a table or stand for supporting the instrument, and 2 represents the legs for said table. Rising from one end of the table is a bracket 3, having formed at its upper end a journal-yoke 4 for one end of the feed-shaft 5, the opposite end of said feed-shaft being journaled in one of the uprights 6 of the motor-frame. A miter-gear 7 is secured to the shaft 5 in any suitable manner, and this gear is in mesh with a miter-gear 8, secured by a screw 9 to a sleeve 10, said sleeve having a solid lower portion which revolves upon a bearing-pin 11, passing through a hole in the yoke 4. A spiral spring 12 is seated in the sleeve 10, and resting upon the upper end of the spring is a pin 13, having a conical point 14. The sleeve 10 is slotted at 15, and a pin 16 passes through the slot, and thus permits the pin 13 to have a vertical play while it is revolved by the miter-gears. The conical point 14 is grooved longitudinally at 17 for a purpose which will be hereinafter

described. An arm 19 extends upward from the yoke 4, and at the upper end of the arm a round flat table 20 is provided. A roller-carriage 21 is pivoted on the table 20 by a screw 21^a. A lever 22 is pivoted on a bracket rising from the roller-carriage, and a roller 24 is journaled at one end of this lever. This roller is preferably made of some soft material, like felt or chamois, in order that, as it bears upon the smooth portion of the disk or record-support, it may be noiseless. The opposite end of the lever 22 has a boss 25, provided with a smooth hole therein to form a seat for an adjusting-screw 26. The end of this screw fits a threaded hole 27 in the roller-carriage 21, and a spiral spring 29 encircles the shank of the screw 26 and bears at one end against the carriage 21 and at its upper end against the boss 25. The record-disk consists of a disk of thin corrugated sheet-steel 30, having a papier-mâché record-ring 31 cemented to each side thereof. The corrugations in the disk 30 serve to stiffen the disk and also to form grooves for the adhesive material for securing the record-rings to the disk. The central aperture 32 in the disk 30 has a number of teeth 33 projecting inward to fit the grooves 17 in the conical point 14 in order to insure their rotation.

The feed-screw 34 is secured to the shaft 5 in any suitable manner, and a nut 35 is secured to an arm 36, connected to a sleeve 37, mounted to slide upon a rod 38, secured to the motor-frame. An arm 39, formed on the sleeve 37, is curved and apertured to carry a sound-box 40, and a pivoted lever 41 holds the sound-box in place in the aperture in said curved arm. This sound-box may consist of a suitable diaphragm 41^a, suitably secured in the box, and a stylus 42, centrally attached to the diaphragm. Since the stylus is not required to vibrate, it need not be of the gravity type, but may be mounted directly to the diaphragm and not weighted to move up and down. To throw the nut out of contact with the feed-screw, a finger-lever 43 is secured to said nut, and journaled in a bracket 44, depending from said lever, is a roller 45, having a round bearing-surface. A tubular eccentric 46 is provided with two longitudinal grooves 47 47^a, in which the roller 45 travels. A handle 48, attached to the eccentric 46, may

be used to raise or lower the feed-nut, the roller 45 running in the groove 47 when the nut is thrown down into contact with the feed-screw and said roller running in the groove 5 47^a when the feed is thrown off. When the nut is raised, the stylus is simultaneously raised from the record. The sound-box arm may be pivoted at 49 to permit the sound-box to be swung out of the way when changing 10 the record, although this is not absolutely necessary.

Any suitable motor may be used for running the instrument, that shown being of the spring type.

15 In making the record I take the original record-disk and electrotype it. From the electrotype I produce a papier-mâché matrix, and this matrix is then mounted upon a thin corrugated steel disk, said disk then serving 20 as the record-support and not requiring the use of a separate table-support made as a part of the instrument. The disk may have a record upon either or both sides.

The operation of the instrument is as follows: When the motor is started, the feed-shaft is rotated, which revolves the miter-gears and imparts the required revolution to the record-disk. When the nut is thrown 30 into contact with the feed-screw, the movement of the sound-box is lateral across the face of the record. The record-disk being supported centrally upon a spring-sustained pin and having a spring-pressed roller bearing upon its outer edge, the record is held up 35 in contact with the stylus with just the required stress to compel the stylus to follow the sound-grooves. The adjusting-screw 26 may be turned to throw the opposite edge of the record-disk up to the stylus with greater 40 or less force. It is to be noted that the center pin, the roller, and the stylus are in the same diametrical line, and these being the

only bearing-points of the record a very sensitive vibratory motion is given to the free edge of the disk by the stylus, and the extent 45 and force of this motion may be readily adjusted by the screw 26.

By means of the construction and arrangement set forth herein the construction of the sound-box may be simplified, some of the 50 parts of the instrument dispensed with, and a more uniform and reliable operation attained. Instead of feeding the sound-box across the record by a very slight change in the mechanism the record may be fed later- 55 ally, and the sound-box may be held stationary.

Various changes in the form, proportion, and the minor details of construction may be resorted to without departing from the principle or sacrificing any of the advantages of this invention. 60

I claim—

1. A record-disk mounted upon a central pin, a roller bearing upon the upper surface 65 of the disk near its periphery, means for adjusting the roller toward and from the disk, and means for revolving the disk in contact with a stylus located in a diametrical line with the central pin and roller. 70

2. In a sound-producing instrument, a record-disk mounted upon a yielding central support, a spring-sustained roller bearing upon the upper surface of the disk near one edge, and a stylus bearing upon the disk in 75 a diametrical line with the central support and roller.

In testimony whereof I affix my signature in presence of two witnesses.

FREDERICK MYERS.

Witnesses:

GUY E. PADGETT,
EDWARD BYRNE.

No. 672,909.

Patented Apr. 30, 1901.

M. C. LEFFERTS.
ART OF MAKING PHONOGRAPHIC CYLINDERS.

(Application filed Oct. 18, 1900.)

(No Model.)

Fig. 1.

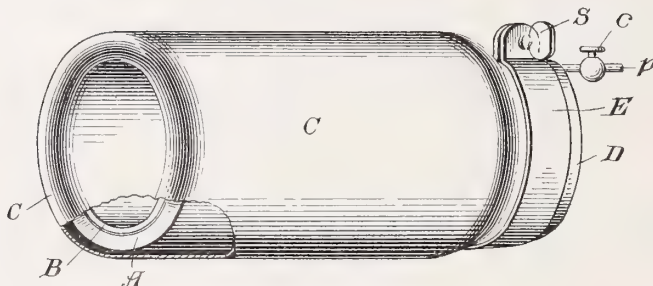


Fig. 2.

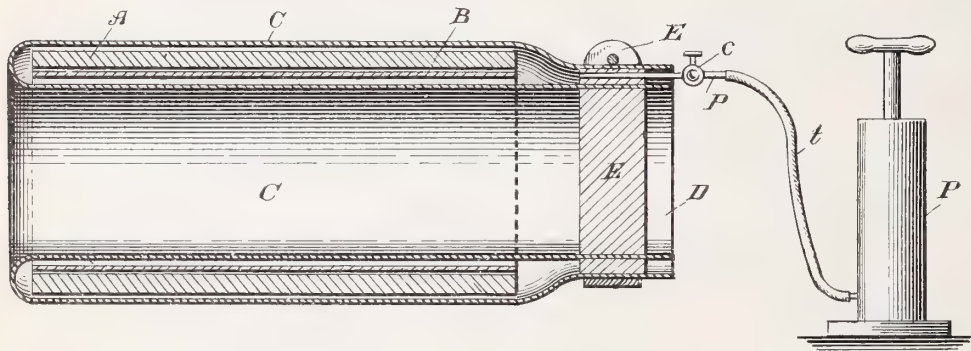
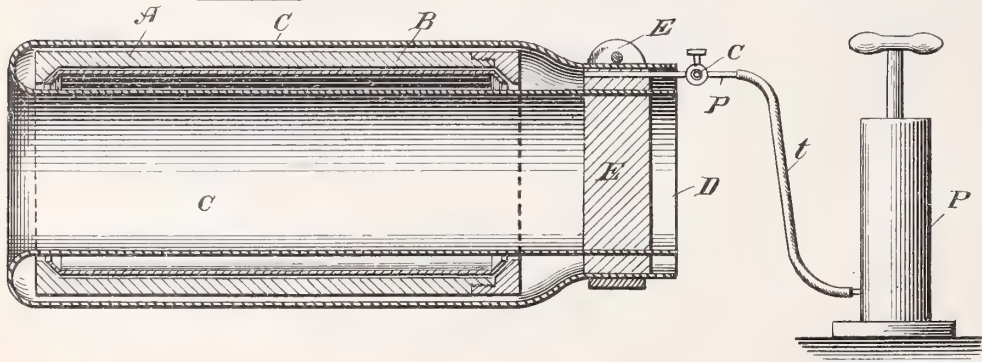


Fig. 3.



WITNESSES:

F. N. Roehrick.
James M. Stewart.

INVENTOR

Marshall C. Lefferts.

BY

John H. H. H. H.
ATTORNEY

UNITED STATES PATENT OFFICE.

MARSHALL C. LEFFERTS, OF NEW YORK, N. Y., ASSIGNOR TO THE CELLULOID COMPANY, OF SAME PLACE.

ART OF MAKING PHONOGRAPHIC CYLINDERS.

SPECIFICATION forming part of Letters Patent No. 672,909, dated April 30, 1901.

Application filed October 18, 1900. Serial No. 33,427. (No specimens.)

To all whom it may concern:

Be it known that I, MARSHALL C. LEFFERTS, a citizen of the United States, residing in the city, county, and State of New York, have invented a new and useful Improvement in the Art of Making Phonographic Cylinders Composed of Celluloid and Similar Pyroxylin Compounds, of which the following is a specification.

This invention relates to the process of making phonographic cylinders having the sound-record on their exterior surfaces by means of a suitable matrix consisting of a copper-electroplate or other suitable material.

Heretofore in molding phonographic cylinders from the matrix such cylinders have been found to be imperfect, owing to the presence of air contained between those surfaces of the matrix and the cylinder which are in contact during the process of molding; and my invention is designed to obviate this defect, as well as to produce a speedy, efficient, and economical method of molding such cylinders.

The apparatus which I employ in practicing my new process is illustrated in the accompanying drawings, in which—

Figure 1 is a perspective view of the matrix and cylinder, with their inclosing jacket in place, previous to their subjection to the molding pressure. Fig. 2 is a sectional view of Fig. 1, showing the addition of an air-pump or other exhausting instrument; and Fig. 3 is a sectional view showing a modified form of the matrix and cylinder.

Similar letters of reference indicate similar parts throughout the several views.

In practicing my process I first make a matrix in copper by electroplating upon the original wax record in the manner now well understood. Any suitable metal may be used for this matrix. By this means I obtain a matrix which has the sound-record in reverse on its interior surface. In the next step of my process I insert within this matrix a cylinder of "celluloid," or similar pyroxylin compound, having an outside diameter slightly smaller than the inside diameter of the matrix. I next pass through the interior of the celluloid cylinder lying within the matrix a tube of thin soft vulcanized rubber

about three times as long as the matrix, and turn the rubber tube over on itself so as to bring it around the outside of the matrix, thus completely inclosing the celluloid cylinder and the matrix and leaving the two ends of the rubber tube projecting at one end. I then insert a plug within the ends of the rubber tube, and then adjust the ends of the rubber over the plug. I then place a clamp over the plug and ends of the rubber tube and clamp the latter tightly upon the former, so as to form an air-tight joint. The plug contains a pipe fitted with a cock, this pipe leading from the outer air to the interior of the inclosing rubber tube. This stage of my process is illustrated in Figs. 1 and 2 of the drawings, in which A represents the matrix. B is the celluloid cylinder. C is the inclosing rubber tube. D is the plug containing the pipe *p*, having the cock *c*, and E is the clamp, having the tightening-screw *s*. In the next step of my process I connect the outer end of the pipe *p* by a flexible tube *t* or other suitable means with an air-pump P (illustrated in Figs. 2 and 3) or other suitable exhaust and exhaust the air from between the sides of the inclosing rubber tube, thus leaving a vacuum between the opposing surfaces of the matrix and celluloid cylinder. I then shut the cock *c* and disconnect the apparatus from the air-pump. In the next step of my process I introduce the matrix and celluloid cylinder thus inclosed in the exhausted jacket, as above described, into a "gun" or vessel containing steam under pressure. The heat of the steam softens the celluloid cylinder and the pressure on the exterior of the rubber jacket forces the juxtaposed surfaces of the softened celluloid cylinder and the matrix into close contact, thus reproducing in relief upon the celluloid cylinder the sound-record contained in reverse upon the surface of the matrix. A cooling medium is then introduced into the gun under pressure greater than that of the steam, so as to displace the steam and cool the celluloid cylinder while still under pressure. When the cylinder is cooled and "set," the jacketed cylinder and matrix are withdrawn from the steam-chamber. The rubber jacket is then removed and the celluloid cylinder can be separated readily

from the matrix by the insertion of a knife between the two, so as to admit air. In many cases the use of the knife will not be necessary, as the contraction of the celluloid itself will be sufficient to admit air between the opposing surfaces.

I do not limit myself to the use of steam in the above operation, as heated air under pressure or hot water under pressure or any heated fluid under pressure would answer the purpose, nor is it necessary that the fluid itself should be heated, as the celluloid cylinder may be softened by a suitable solvent, such as amyl acetate, applied to the surface thereof prior to the subjection of the jacketed matrix and celluloid cylinder to the pressure of the fluid under pressure. I prefer, however, the use of steam as being more convenient and also prefer to partially soften the surface of the celluloid by the use of a solvent in addition to the use of heat, for I find that the solvent has a beneficial effect in causing the celluloid to flow more evenly under the influence of heat and pressure.

In Fig. 3 I have shown a slight modification of the shape of the matrix and celluloid cylinder. As the phonographic instruments are made of a standard size and fitted for wax cylinders of a uniform diameter, and many of these instruments are now in use, and it is desirable that they can be used both with the standard wax cylinders now in general use as well as the celluloid cylinders, and as the celluloid cylinders can be economically made thinner and with a considerably larger interior diameter than the wax cylinders, owing to the nature of the material, it is necessary to so construct the celluloid cylinders that they will fit on the mandrel of the machine which is suited to the size of the ordinary wax cylinders, and my modification is designed to effect this object. In Fig. 3 the copper matrix A is shown as made with a permanent flange *f* upon it, projecting into the interior of the matrix, the interior diameter of this flange being about the size requisite to fit upon the mandrel of the machine. After the matrix and inner celluloid cylinder have been placed within the jacket D a removable flange *f'* is screwed upon or otherwise suitably fastened to the other end of the matrix A, and during the molding operation, of course, the celluloid cylinder B will take the shape of this shaped matrix A, and thus fit upon the mandrel of the machine.

I do not limit myself to the particular mode of constructing the jacket by means of a rubber tube as herein described nor to the use of rubber solely, for any suitable material will do and any mode of constructing the jacket which incloses the matrix and celluloid cylinder in a collapsible chamber from which the air can be exhausted may be adopted, nor do I confine myself to the use of a fluid-pressure to press the surfaces of the matrix and celluloid cylinder into contact, for, if desired, mechanical pressure, such as an

expansible mandrel, may be employed for this purpose.

Where I have used the word "celluloid" in this specification and the claims, I refer to pyroxylin compounds similar to "celluloid," which is the trade-name of the best of these compounds.

Having thus described my invention, what I claim is—

1. The improvement in the art of making phonographic sound - records composed of "celluloid" and similar pyroxylin compounds, which consists in the following steps: first, placing a "celluloid" cylinder within a matrix having a sound-record on the interior surface thereof; second, placing said matrix and cylinder within a collapsible chamber, and exhausting the air from said chamber; third, subjecting the said jacketed matrix and cylinder to heat and pressure; fourth, cooling said matrix and cylinder, and separating the one from the other, substantially as described.

2. The improvement in the art of making phonographic sound - records composed of "celluloid" and similar pyroxylin compounds which consists in the following steps: first, placing a "celluloid" cylinder within a matrix having a sound-record on the interior surface thereof; second, placing said matrix and cylinder within a collapsible chamber, and exhausting the air from said chamber; third, subjecting said jacketed matrix and cylinder to the action of a heated fluid-pressure; fourth, cooling said matrix and cylinder, and separating the one from the other, substantially as described.

3. The improvement in the art of making phonographic sound - records composed of "celluloid" and similar pyroxylin compounds, which consists in the following steps: first, placing a "celluloid" cylinder within a matrix having a sound-record on the interior surface thereof; second, placing said matrix and cylinder within a collapsible chamber, and exhausting the air from said chamber; third, heating said jacketed matrix and cylinder; fourth, subjecting said heated jacketed matrix and cylinder to pressure; fifth, cooling said matrix and cylinder, and separating the one from the other, substantially as described.

4. The improvement in the art of making phonographic sound - records composed of "celluloid" and similar pyroxylin compounds, which consists in the following steps: first, placing a "celluloid" cylinder within a matrix having a sound-record on the interior surface thereof; second, placing said matrix and cylinder within a collapsible chamber, and exhausting the air from said chamber; third, heating said jacketed matrix and cylinder; fourth, subjecting said jacketed matrix and cylinder to fluid-pressure; fifth, cooling said matrix and cylinder, and separating the one from the other, substantially as described.

5. The improvement in the art of making phonographic sound - records composed of

"celluloid" and similar pyroxylin compounds, which consists in the following steps: first, softening the surface of a "celluloid" cylinder with a solvent, and placing it within
 5 a matrix having a sound-record on the interior surface thereof; second, placing said matrix and cylinder within a collapsible chamber, and exhausting the air from said chamber; third, subjecting said jacketed matrix and
 10 cylinder to heat and pressure; fourth, cooling said matrix and cylinder, and separating the one from the other, substantially as described.

6. The improvement in the art of making phonographic sound - records composed of
 15 "celluloid" and similar pyroxylin compounds, which consists in the following steps: first, softening the surface of a "celluloid" cylinder with a solvent, and placing it within a matrix having a sound-record on the interior
 20 surface thereof; second, placing said matrix and cylinder within a collapsible chamber, and exhausting the air from said chamber; third, subjecting said jacketed matrix and cylinder to the action of a heated fluid-pres-
 25 sure; fourth, cooling said matrix and cylinder, and separating the one from the other, substantially as described.

7. The improvement in the art of making phonographic sound - records composed of
 30 "celluloid" and similar pyroxylin compounds, which consists in the following steps:

first, softening the surface of a "celluloid" cylinder with a solvent, and placing it within a matrix having a sound-record on the interior
 35 surface thereof; second, placing said matrix and cylinder within a collapsible chamber and exhausting the air from said chamber; third, heating said jacketed matrix and cylinder; fourth, subjecting said heated jacketed
 40 matrix and cylinder to pressure; fifth, cooling said matrix and cylinder, and separating the one from the other, substantially as described.

8. The improvement in the art of making phonographic sound - records composed of
 45 "celluloid" and similar pyroxylin compounds, which consists in the following steps: first, softening the surface of a "celluloid" cylinder with a solvent and placing it within a matrix having a sound-record on the interior
 50 surface thereof; second, placing said matrix and cylinder within a collapsible chamber, and exhausting the air from said chamber; third, heating said jacketed matrix and cylinder; fourth, subjecting said jacketed matrix
 55 and cylinder to fluid-pressure; fifth, cooling said matrix and cylinder, and separating the one from the other, substantially as described.

MARSHALL C. LEFFERTS.

In presence of—

J. R. HALSEY,
 A. TISCHLER.

No. 672,979.

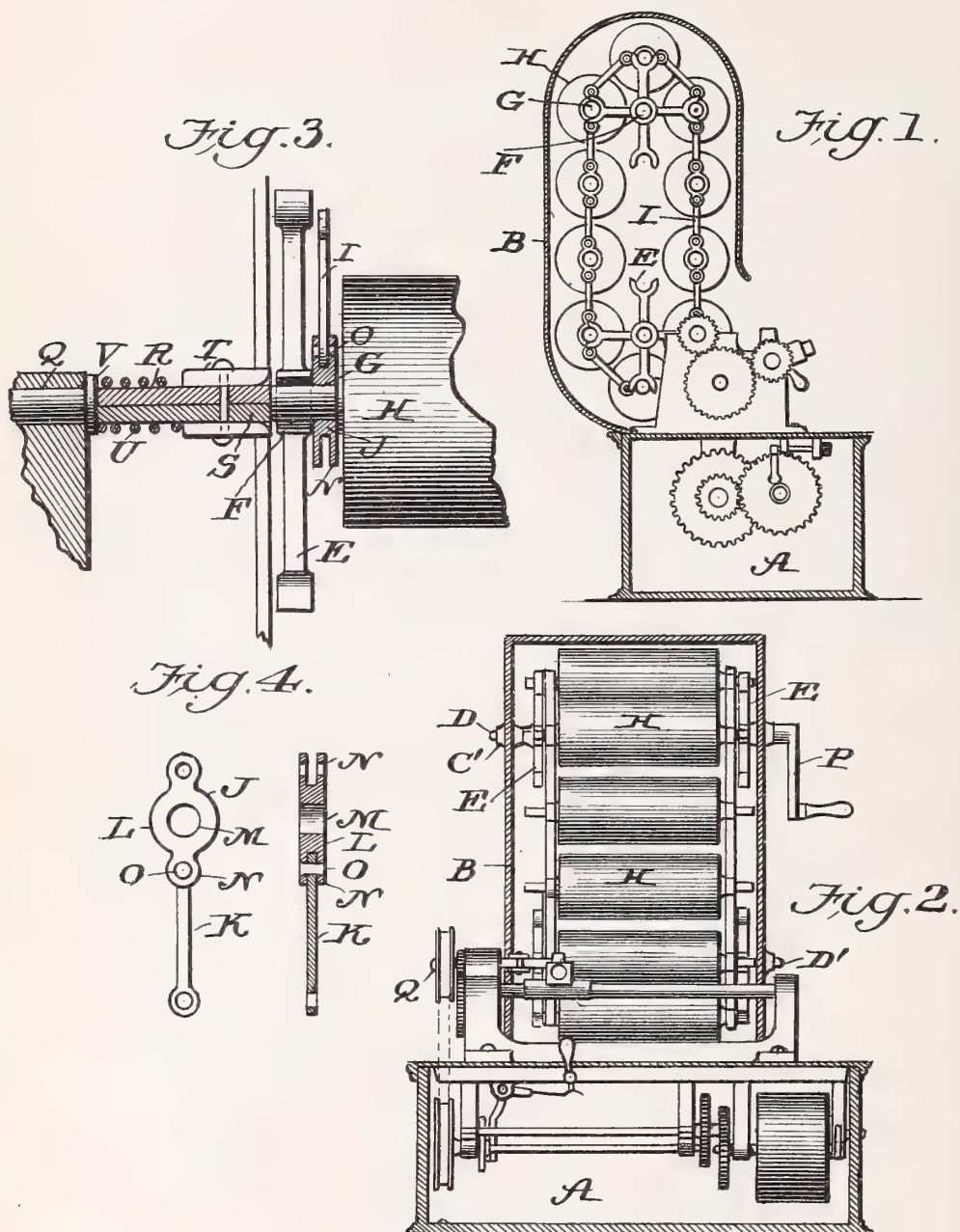
Patented Apr. 30, 1901.

W. T. GELTZ.

GRAPHOPHONE, PHONOGRAPH, OR TALKING MACHINE.

(Application filed Oct. 3, 1900.)

(No Model.)



Witnesses.
Jas. A. Ryan
H. M. Moore

Inventor.
William T. Geltz.
by Thomas E. Barrow,
Attorney

UNITED STATES PATENT OFFICE.

WILLIAM T. GELTZ, OF MANSFIELD, OHIO.

GRAPHOPHONE, PHONOGRAPH, OR TALKING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 672,979, dated April 30, 1901.

Application filed October 3, 1900. Serial No. 31,941. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM T. GELTZ, a citizen of the United States, residing at Mansfield, in the county of Richland and State of Ohio, have invented certain new and useful Improvements in Graphophones, Phonographs, or Talking-Machines; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

My invention relates to improvements in graphophones, phonographs, or talking-machines; and the objects of my invention are, first, to arrange any number of record-cylinders so they can be attached to a graphophone or phonograph, the said cylinders so arranged that they can be operated by the mechanism operating said machines, either coin-controlled or otherwise, and, second, to supply a novel, cheap, durable, and efficient device for the purpose stated. These objects I accomplish by the mechanism illustrated in the accompanying drawings, in which—

Figure 1 is an end elevation of a graphophone, showing end view of my improved cylinder-attachment device secured upon said machine. Fig. 2 is a front elevation to show more fully the general construction and arrangement of the parts constituting my invention. Fig. 3 is an enlarged view of a portion of one of the record-cylinders to show more fully the mechanism to connect the same to the graphophone. Fig. 4 is an enlarged view of one of the links constituting the chain and bearings for the cylinder-journals.

Similar letters of reference indicate the same parts throughout the several views.

In the accompanying drawings, A indicates a graphophone of general construction now in general use. The construction of the machine I shall not describe, as I do not make any claim for the same, only to show the combination of the machine with my improvement.

B indicates a metal or wood case secured upon the top of the graphophone-case by any

suitable mechanism. Each end of the case is provided with the box-bearing C, and in which are journaled the sprocket-wheel shafts D. 55

The sprocket-wheels E are composed of a center hub F, having four arms radiating from the center. Said arms are forked at their ends, and in the same mesh the journals G, formed upon each end of the record-cylinders H. The sprocket-wheels are four in number, two secured upon the upper shaft D and two upon the lower shaft D'. The said sprocket-wheels are placed a sufficient distance apart to allow the record-cylinders to pass between the same. 65

I indicates an endless chain, which is composed of a series of journal-bearings J and bar connections K. The portion J is composed of a center hub L, provided in the center with the hole M to receive the journals G, and it is also provided upon each side and in line with the center with the bifurcated lugs N to receive the ends of the connections K, which are hinged within the bifurcations and held in position by the pins O, passing through the hole in the connections K and bifurcated lugs N. A chain of this construction is placed at each end of the cylinders, each cylinder journaled at each end and placed in the bearings J, forming part of the chain. The chains connecting the cylinders are supported by the shafts and sprocket-wheels, as shown in Figs. 1 and 2. Either the upper or lower shaft is made to extend through the end of the case B to receive the crank P to operate and change the position of the cylinders through the action of the sprocket wheels and chain to any position required to be operated upon by the power mechanism operating the graphophone. 80 85 90

In Fig. 3 I have shown a device to connect the record-cylinders to the driving mechanism to rotate the same. The upper pulley-shaft Q is squared upon the inner end R, also the ends S of the cylinder-journals G. A sleeve T, provided with a square hole through its center, is placed upon the shaft R, and a coil-spring U surrounding the said shaft and placed between the sleeve T and collar V. When the operator wishes to change from one cylinder to another, he moves the slide from off the end of the cylinder-shaft and then turns the crank P one-fourth of a revo- 95 100

lution, which will bring into position the next cylinder in line with the sleeve T. The sleeve is then released, and the expansion of the spring will force the sleeve upon the end of the cylinder-shaft into the position shown in Fig. 3.

I do not wish to limit myself to placing the series of cylinders in a vertical position. They may be placed horizontal or upon an incline without departing from the object of the invention.

I have not shown any coin-controlling mechanism, for any devices now in use are appropriate.

Having fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In combination with a talking-machine, of a casing connected with the case thereof, two shafts mounted in said casing at the upper and lower portions thereof, sprocket-wheels mounted upon said shafts and having semicircular depressions in their arms, an end-

less chain passing around said sprockets, and records journaled in the links of said chains, and adapted to have their shafts rest in the depressions of the sprockets to guide the chains therearound.

2. In combination with a talking-machine, the record-holding device consisting of a pulley-shaft having a squared end and a spring-actuated sleeve, of a casing connected with the case of the machine, two shafts mounted in said casing, sprocket-wheels mounted upon said shafts and having depressions in their arms, an endless chain passing around said sprockets, and records journaled in the links of said chains and adapted to have their shafts rest in the depressions of the sprockets to guide the chains therearound.

In testimony whereof I affix my signature in presence of two witnesses.

WILLIAM T. GELTZ.

Witnesses:

GEORGE BRINKERHOFF,
CHARLES BAER.

No. 673,267.

Patented Apr. 30, 1901.

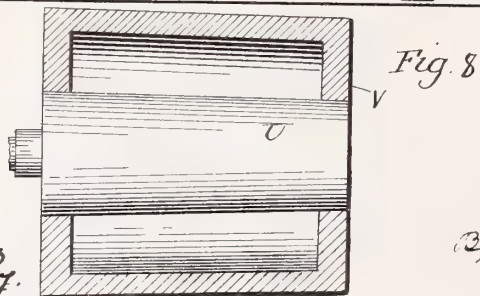
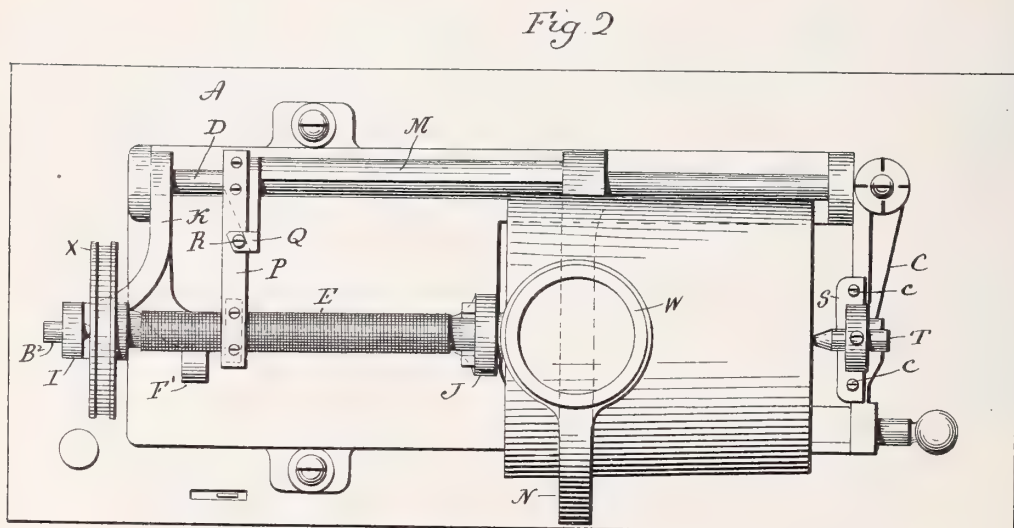
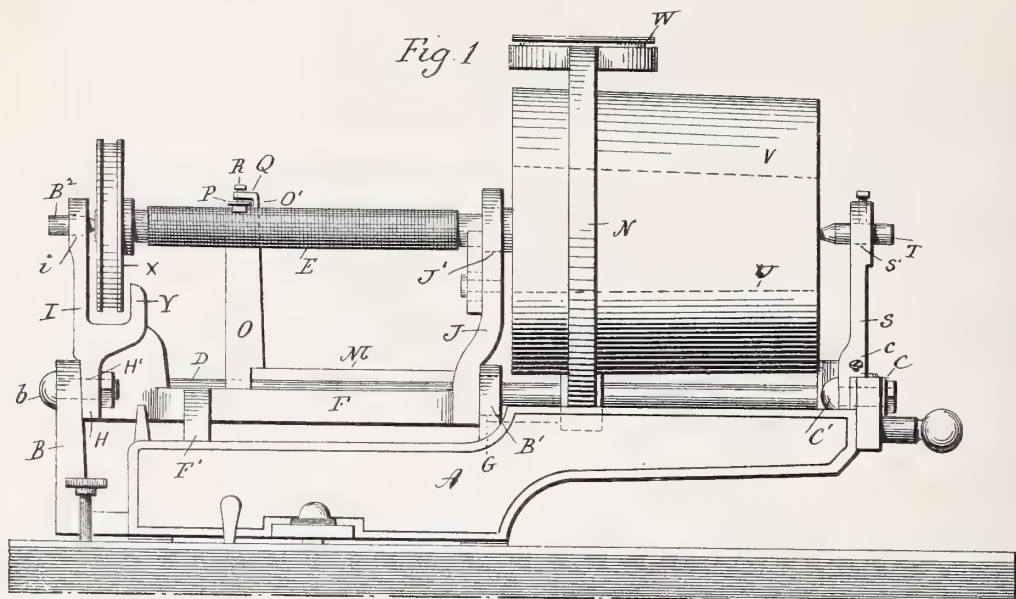
H. A. HULL.

ATTACHMENT FOR PHONOGRAPHS.

(Application filed Nov. 14, 1900.)

(No Model.)

2 Sheets—Sheet 1



Witnesses.
J. H. Shaw,
Attorney at Law.

Henry A. Hull.
Inventor
By atty Seymour T. Carr

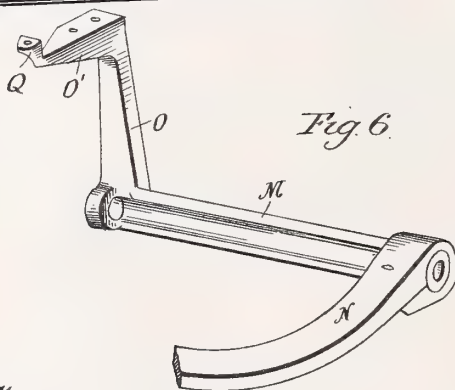
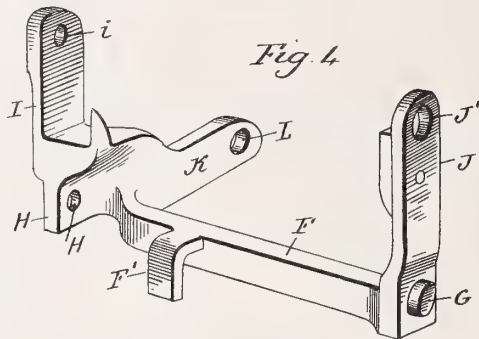
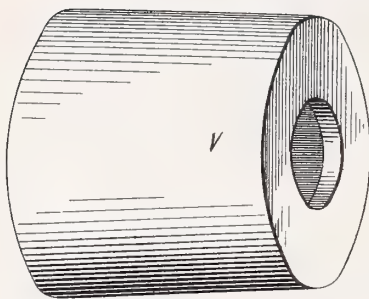
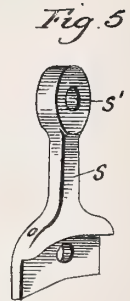
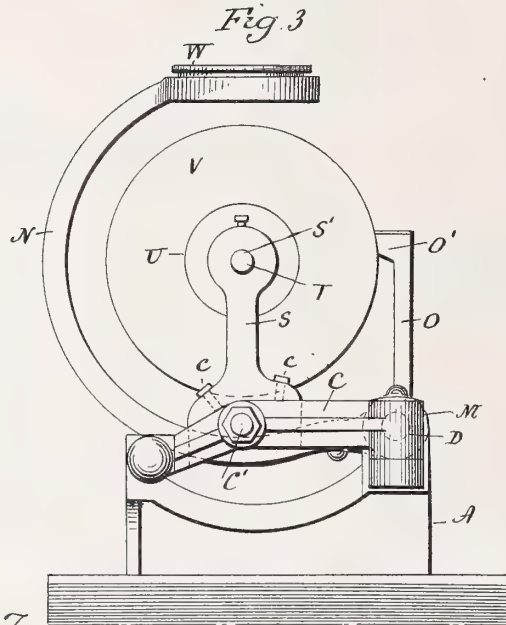
H. A. HULL.

ATTACHMENT FOR PHONOGRAPHS.

(Application filed Nov. 14, 1900.)

(No Model.)

2 Sheets—Sheet 2.



Witnesses.
J. H. Shumway
William D. Kelley

Henry A. Hull
Inventor.
By Atty. Seymour T. Earle

UNITED STATES PATENT OFFICE.

HENRY A. HULL, OF NEW HAVEN, CONNECTICUT.

ATTACHMENT FOR PHONOGRAPHS.

SPECIFICATION forming part of Letters Patent No. 673,267, dated April 30, 1901.

Application filed November 14, 1900. Serial No. 36,499. (No model.)

To all whom it may concern:

Be it known that I, HENRY A. HULL, of New Haven, in the county of New Haven and State of Connecticut, have invented a new Improvement in Attachments for Phonographs; and I do hereby declare the following, when taken in connection with the accompanying drawings and the letters of reference marked thereon, to be a full, clear, and exact description of the same, and which said drawings constitute part of this specification, and represent, in—

Figure 1, a front view of a phonograph having my attachments applied thereto; Fig. 2, a top view of the same; Fig. 3, a gate-end view; Fig. 4, a perspective view of the yoke detached; Fig. 5, a perspective view of the auxiliary bearing; Fig. 6, a perspective view of the sleeve and the parts carried thereby, the diaphragm-arm being broken away; Fig. 7, a perspective view of the cylinder-shell; Fig. 8, a sectional view showing the cylinder-shell mounted upon the usual cylinder-bearing.

This invention relates to an improvement in attachments for phonographs whereby a "home" or small phonograph may be readily transformed into a "concert-grand" or large phonograph, or, in other words, a phonograph adapted to employ small cylinder-records changed to operate with a large cylinder-record, the object of the invention being to so construct the attachment that it can be readily applied to and removed from a phonograph and without requiring careful adjustment of parts; and it consists in the construction hereinafter described, and particularly recited in the claims.

The body A of the phonograph is of ordinary construction, provided at one end with a bearing B for one end of the mandrel feed-screw, a bearing B' near the center, and at the opposite end with a swinging gate C and at the rear with a bearing-rod D. To adapt a small machine to receive and operate with a large record, I remove the mandrel feed-screw E, and into the bearings B B' thereof I insert a yoke comprising a bar F, provided at one side with a projecting trunnion G, adapted to enter the bearing B', and at the opposite end with a block H, having an opening H' therein, adapting that end to be secured to

the bearing B by a bolt b, extending through the opening in which a pointed center was formerly mounted as a support for the mandrel feed-screw, and from the bar and head are upwardly-extending arms I J, corresponding to the bearings B B'. Extending rearwardly from the head is an arm K, having an opening L therein, adapting it to be passed over the back rod D. As an additional support for the yoke I preferably form the bar F with a foot F', which bears upon the body A. The arm I is formed with an opening i, adapted to receive the bearing-point B², which was before mounted in the bearing B, and the arm J will have an opening J', through which the mandrel passes. Preferably the arm J will have a slotted plate J² adjustably secured to one of its side faces and notched at its upper end, which extends into the line of the opening J' and so that the bearing for the said feed-screw is made adjustable. In place of the usual sleeve on the back rod D, I employ a sleeve M, provided at one end with a diaphragm-arm N, which instead of extending rearward over the mandrel extends forward beneath it and upward over the same, as clearly shown in Fig. 3. At the opposite end the sleeve M is provided with an upwardly-extending nut-arm O, having a head O' at its upper end, adapted to support a feed-nut arm P, and this head O' is provided at its outer end with a raised boss Q, through which an adjusting-screw R extends to bear upon the feed-nut arm P, which passes beneath the boss, so as to depress the same with more or less friction upon the mandrel feed-screw E. This mandrel feed-screw is mounted in the bearings formed at the upper ends of the arms I J, one end centered on the bearing-point B² and its center supported by the arm J. To support the opposite end of the mandrel, I employ a gate extension S, which is secured to the gate C by a bolt C', extending through the opening in which the bearing-point was mounted, and to adjust the extension I employ adjusting-screws c c, which pass down through the extension and bear upon the gate. The extension is provided at its upper end with an opening S', adapted to receive the bearing-point T, which was previously mounted in the gate C. Over the ordinary cylinder-bearing U on the feed-

screw mandrel I place a cylinder-shell V of suitable size to receive and support a large record. As before stated, the diaphragm-arm M extends above the enlarged cylinder-shell and preferably is provided with an opening to receive a collar W, which is screw-threaded into the upper end of the arm, which collar receives the ordinary diaphragm, and as this collar is adjustable it is apparent that the diaphragm may be adjusted to or from the record on the mandrel. On the mandrel feed-screw E is the usual driving-pulley X, which for large cylinders will preferably be larger than that used for small cylinders, and on the head H is a boss Y, which guides the belt and prevents it from slipping from the driving-pulley and prevents the removal of the shaft. It will thus be seen that the same mandrel feed-screw and the points for supporting the same are employed as in small machines of usual construction. The frame is the same, and therefore the only parts necessary to adapt a small machine to operate with a large record are the yoke, sleeve, and its adjacent parts, gate extension, and a cylinder-shell. These parts are so simple in construction that they may be readily cast and adapted to be applied to machines as found on the market.

Having fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a phonograph, the combination with the usual mandrel-feed-screw bearings, mandrel feed-screw, swinging gate and mandrel-support, of a yoke adapted to be mounted in the said mandrel-feed-screw bearings, said yoke provided with upwardly-extending arms for supporting the said mandrel feed-screw, an upwardly-extending gate extension adapted to be secured to the said swinging gate, and adapted to carry the said mandrel-support at its upper end, a back-rod sleeve carrying a diaphragm-arm, and a cylinder-shell, substantially as described.

2. In a phonograph, the combination with the usual bearings for the mandrel feed-screw, the mandrel feed-screw, the back rod, the swinging gate and the support for the mandrel, of a yoke adapted to be mounted in the said bearings for the mandrel feed-screw, and formed with upwardly-extending arms with bearings for the said mandrel feed-screw, a rearwardly-extending arm for engagement

with the said back rod, a gate extension adapted to be secured to the said swinging gate, and adapted at its upper end to carry the said support for the mandrel, a sleeve mounted upon the back rod and carrying a diaphragm-arm which extends forward below the mandrel and upward above the same, the said mandrel-arm carrying at its upper end an adjustable collar adapted to receive a diaphragm, substantially as described.

3. In a phonograph, the combination with the usual bearings for the mandrel feed-screw, mandrel feed-screw, back rod, swinging gate, and support for the mandrel, of a yoke adapted to be mounted in the said bearings for the mandrel feed-screw, and formed with upwardly-extending arms having bearings for the said mandrel feed-screw, a rearwardly-extending arm for engagement with the said back rod, a gate extension adapted to be secured to the said swinging gate and adapted at its upper end to carry the said support for the mandrel, a sleeve mounted upon the said back rod, and carrying a diaphragm-arm which extends forward below the mandrel and upward above the same, substantially as described.

4. In a phonograph, the combination with the usual bearings for the mandrel feed-screw, mandrel feed-screw, back rod, swinging gate and support for the mandrel, of a yoke adapted to be mounted in the said bearings for the mandrel feed-screw, and formed with upwardly-extending arms having bearings for the said mandrel feed-screw, a rearwardly-extending arm for engagement with the said back rod, a gate extension adapted to be secured to the said swinging gate, and adapted at its upper end to carry the said support for the mandrel, a sleeve mounted upon the said back rod and carrying a diaphragm-arm and a nut-arm formed at its upper end with a head adapted to support a feed-nut arm, said head formed with a boss to receive an adjusting-screw which bears upon said feed-nut arm, and a cylinder adapted to be set over the mandrel, substantially as described.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

HENRY A. HULL.

Witnesses:

FRED. C. EARLE,

GEORGE D. SEYMOUR.

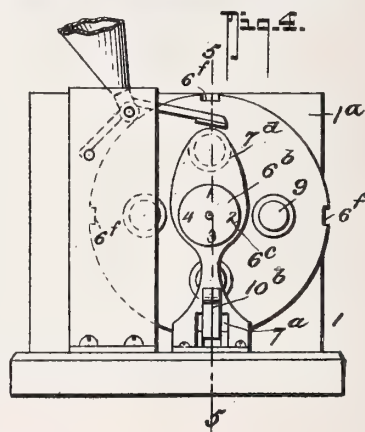
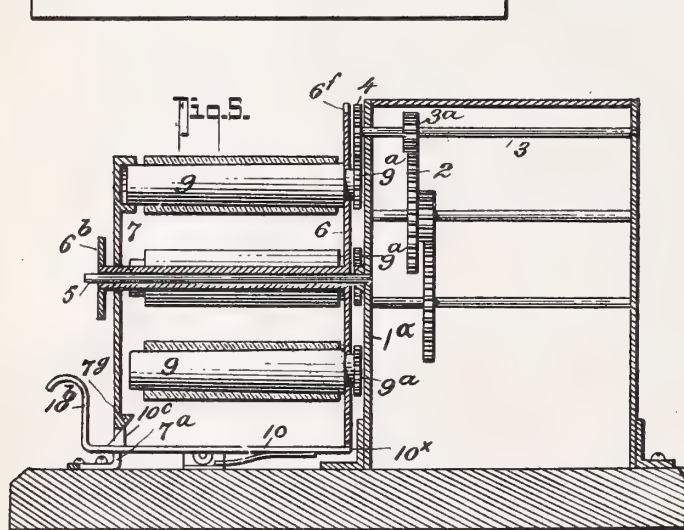
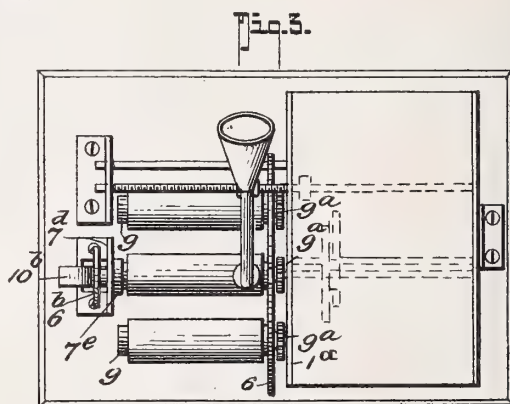
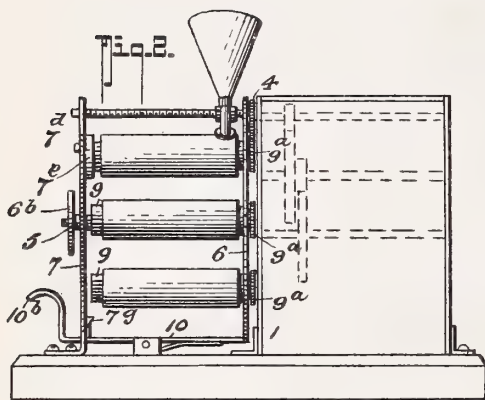
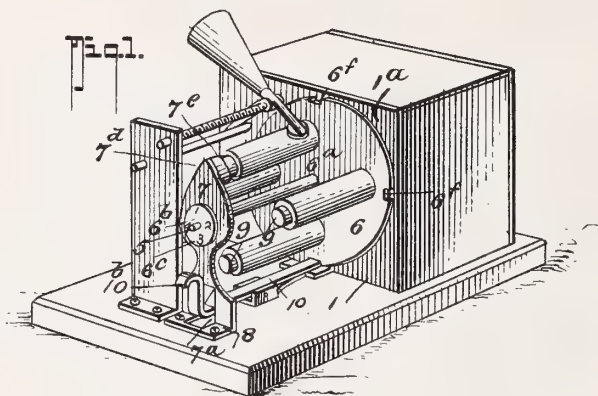
No. 673,413.

Patented May 7, 1901.

W. T. BAKER & B. F. CLAYTON.
MULTIPLE PHONOGRAM OR RECORD HOLDER.

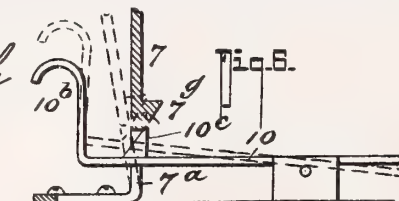
(Application filed June 21, 1900.)

(No Model.)



WITNESSES:

Louis Dieterich
E. McCormick



INVENTORS
William T. Baker
Benjamin F. Clayton
BY
Fred G. Dittus & Co.
ATTORNEYS

UNITED STATES PATENT OFFICE.

WILLIAM T. BAKER AND BENJAMIN F. CLAYTON, OF LOUISVILLE,
KENTUCKY.

MULTIPLE PHONOGRAM OR RECORD HOLDER.

SPECIFICATION forming part of Letters Patent No. 673,413, dated May 7, 1901.

Application filed June 21, 1900. Serial No. 21,096. (No model.)

To all whom it may concern:

Be it known that we, WILLIAM T. BAKER and BENJAMIN F. CLAYTON, residing at Louisville, in the county of Jefferson and State of Kentucky, have invented a new and Improved Multiple Phonogram or Record Holder, of which the following is a specification.

This invention relates to improvements in graphophones, phonographs, and other sound producing and reproducing instruments; and it more especially has for its purpose to provide an improved means for supporting a plurality of phonograms or recorders coöperatively with the stylus and stylus-operating mechanism in such manner that any one of a set of phonograms or records can be quickly and conveniently set to an operative position—that is, in engagement with the stylus—without disturbing the remaining ones of the phonograms or recorders.

Primarily our invention seeks to provide a mechanism of the character stated of a very simple and economical construction capable of being easily manipulated and to effectively serve for its intended purposes, the same being so arranged as to readily coöperate with any of the well-known types of graphophones or phonograph stylus-carrier and the operating mechanisms therefor.

Our invention in its complete make-up includes a simple and easily-operated means for setting the record-carrier to bring any desired one of the records into the proper position to engage the stylus and simultaneously provide a stable bearing for one end of the shaft or spindle carrying the record to be operated, whereby to positively hold the said record in a true alinement with the movement of the stylus and reduce, as it were, the danger of irregular or a lateral scraping action of the stylus on the record lines or waves to the minimum, the same setting devices being also operatively connected with detent mechanism for holding the record-carrier to any of its set positions.

In its subordinate features our invention consists in certain details of construction and novel combination of parts, all of which will be hereinafter fully described, and particularly pointed out in the claims, reference be-

ing had to the accompanying drawings, in which—

Figure 1 illustrates our invention as applied for use in connection with a graphophone. Fig. 2 is a side view of our invention, so much of the gear mechanism and supporting-frame being shown as is necessary to illustrate the general arrangement of the same. Fig. 3 is a plan view of the parts shown in Fig. 2. Fig. 4 is an end elevation of the same. Fig. 5 is a transverse section thereof, taken on the line 5 5 of Fig. 4; and Fig. 6 is a detail view of the combined end bearing-frame and detent devices hereinafter referred to.

In the practical construction our improvement embodies in its make-up a suitably-constructed supporting-frame, (indicated by 1 in the drawings,) in which the drive mechanism for imparting motion to the record or phonogram cylinder is mounted. This mechanism may be of any approved construction, as it, *per se*, forms no part of our invention.

In the drawings, 2 indicates one of a train of drive-gears of the said mechanism which meshes with the gear 3^a on the supplemental drive-shaft 3, the front end of which extends beyond the front plate 1^a of the frame 1 and carries a gear 4, which acts as the driver for imparting motion to any one of the several spindles upon which the phonograms or records are mounted, as will presently be fully explained.

Projected outward at right angles from the front plate 1^a is a rigidly-held shaft 5, which extends in a plane parallel with the line of movement of the stylus. Upon the shaft 5 is rotatably mounted a carrier consisting of a circular disk 6, centrally apertured to fit loosely upon the shaft 5. This disk has an outwardly-extending tubular hub 6^a, into which the shaft 5 extends when the parts are assembled, as shown. The outer end of the hub 6^a is loosely mounted in the standard 7, projected up from the base 8, and the extreme end of the hub 6^a carries a dial 6^b, having indicating characters 6^c—one for each record or phonogram—mounted upon the carrier 6. The standard 7 is preferably formed of spring metal, and the lower end of the same has a foot, whereby it can be conveniently

secured to the base *a*, and the said lower end is slotted, as at 7^a, the reason of which will presently appear.

Fixedly secured to and projected outward from the circular disk 6 is a series of spindles 9, of a proper diameter to receive and hold the records or phonograms. All of the spindles 9 are of such length that their outer edges will pass closely to the inner face of the upwardly-extending portion 7^d of the standard 7, the said inner face of the standard being formed with a socket 7^e, which when the desired one of the records is brought into position serves as a bearing for the outer end of the spindle upon which such record is mounted, and thereby provides for holding both ends of the spindle in proper position to secure a uniform rotation of the record and maintain it in such proper relation to the stylus as to effect a reproduction of the sounds with but a minimum scratching or rasping action. All of the spindles 9 have their axis arranged in a like concentric line with the shaft 5, and the inner end of each spindle is projected through the disk 6 and carries a gear-wheel 9^a.

By arranging the parts in the manner described it is manifest that as any one of the record-holding spindles is brought up into an operative position its gear-wheel 9^a will be brought into mesh with the driver gear-wheel 4, hereinbefore referred to.

The peripheral edge of the disk 6 has notches 6^f, one for each record-holding spindle, with any one of which when moved in proper position a pivoted detent or locking-latch 10 engages, said latch being spring-held to its locking position, as shown in the drawings. The outer end of the locking-latch 10 passes through the slotted portion 7^a of the standard 7 and terminates in an upwardly-projecting finger-lift 10^b. The locking member 10 is also provided with a wedge portion 10^c, which lies on a contra wedge portion 7^g, formed on the inner face of the standard 7, the two portions 7^g and 10^c being so arranged relatively that when the finger end of the member 10 is lifted its end 10^x will be forced down out of engagement with the notch in the disk 6, and at the same time the wedge portion 10^c will engage the standard 7 and spring it out sufficiently to move its upper or socket end from engagement with the outer end of that spindle 9 last journaled in the said socket, and thereby leaves the record-carrier free to rotate upon its shaft, and when so freed the carrier can be turned to bring any one of the other records and its supporting-spindle into a proper operative position, which movement is effected by turning the dial 6^b to bring the desired member or character thereon in line with the index on the outer face of the standard 7.

We are aware that multiple-record-holding means have heretofore been provided and generically we make no claim therefor. Our invention, so far as we know, differentiates

from what has heretofore been provided for the same purpose in the manner in which the record-holding spindles are supported, the detent devices for holding the carrier upon which the records are supported to its adjusted positions, and the means for releasing the outer ends of the spindles simultaneously with the releasing of the carrier-disk from the detent that holds the said disk from turning. Again, our invention also provides for permitting the changing of the records without stopping the record-spindle drive mechanism 6, the same being accomplished by reason of the standard 7 having outward movement from the frame 1. Thus should it be desired to bring another record into position without stopping the mechanism 2 the operator as he grasps the dial end of the carrier by pulling on the same outwardly will slide the carrier-disk and hub sufficiently outward to disengage the gear 9^a from the drive-gear 4, the hub 6^a having for this purpose a shoulder 6^x, which engages the inner side of the standard 7, as shown.

From the foregoing description, taken in connection with the accompanying drawings, it is thought the advantages of our invention will be readily understood.

By providing means for releasing the carrier, so that it turns freely upon the shaft 5, and also for moving the said carrier so that the record-spindle 9 will become disengaged from the driving mechanism a second record can be quickly brought into position without stopping the mechanism on the machine, it being understood that when this is done the stylus may be thrown back, so as not to engage the record until the second record is properly adjusted in position. Furthermore, by providing a standard formed of a spring-body the same will automatically move into position to form a support for the outer end of the spindle, and thereby positively hold the spindle in a proper position to rotate without danger of sagging or twist action, keeping, as it were, the record in a proper position to cooperate with the stylus to produce perfect vibrations.

The devices illustrated in the drawings show generally the arrangement of our invention; but we desire it understood that the parts illustrated might be modified or the details slightly changed without departing from the spirit of our invention or the scope of the appended claims.

Having thus described our invention, what we claim, and desire to secure by Letters Patent, is—

1. A multiple-record holder for the purposes described, comprising a frame, a drive mechanism, a disk rotatably mounted on the frame, a series of record-receiving spindles mounted on said disk, each spindle being independently rotatable and having a gear at one end to engage with the drive mechanism, a standard spring-pressed in the direction of the outer end of the spindles and having a socket forming a bearing for the outer end of

the spindle carrying the record to be operated on, and the latch-lever for locking the disk to its adjusted position, said lever having a connection with the standard whereby as it is moved to a disk-releasing position it will engage the standard and move it from engagement with the spindle, substantially as shown and described.

2. The combination with the frame and the drive mechanism, including the gear 4, and the outwardly-extending shaft 5; of the disk 6, rotatably mounted on the shaft 5, said disk having a tubular extension, the standard 7, having a bearing for the tubular extension, the dial mounted upon the said tubular extension, said standard having its inner face formed to normally engage with and provide a bearing for the outer end of the record-spindle, a series of spindles carried on the disk, each having an independent rotary movement and each having a gear 9^a, adapted to engage the gear 4, and a single finger-operated lever device, normally engaging the disk to hold it from rotation and adapted when moved to its released position to simultaneously free the disk to permit it to turn upon its bearing and move the standard from engagement with the free end of the spindle, all being arranged substantially as shown and described.

3. The hereinbefore-described improvement in multiple-record devices for graphophones and the like, comprising in combination; a suitable frame, a drive mechanism

mounted thereon including the gear 4, the disk 6, rotatably mounted upon the frame, said disk having an outwardly-extending tubular extension, the outer end of which carries a dial, a series of spindles projected in a concentric line from the disk, each spindle being independently rotatable upon the disk and carrying upon its inner end a gear adapted to be brought into mesh with the drive-gear 4, the standard 7, said standard having its upper end spring-pressed inwardly, the upper end of said standard having a socket to receive the outer or free end of the spindles as they are brought into an operative position, the standard having a wedge-shaped portion 7^c, said standard being slotted at a point below the said wedge-shaped portion, the pivoted lever 10, said lever having its inner end arranged to engage with predetermined portions of the disk 6, and lock it from movement, the outer end of said lever projecting through the slotted portion of the standard and terminating in an upwardly-extending finger portion and having a wedge portion 10^c, adapted to engage the wedge portion 7^c, on the standard, all being arranged substantially as shown and for the purposes described.

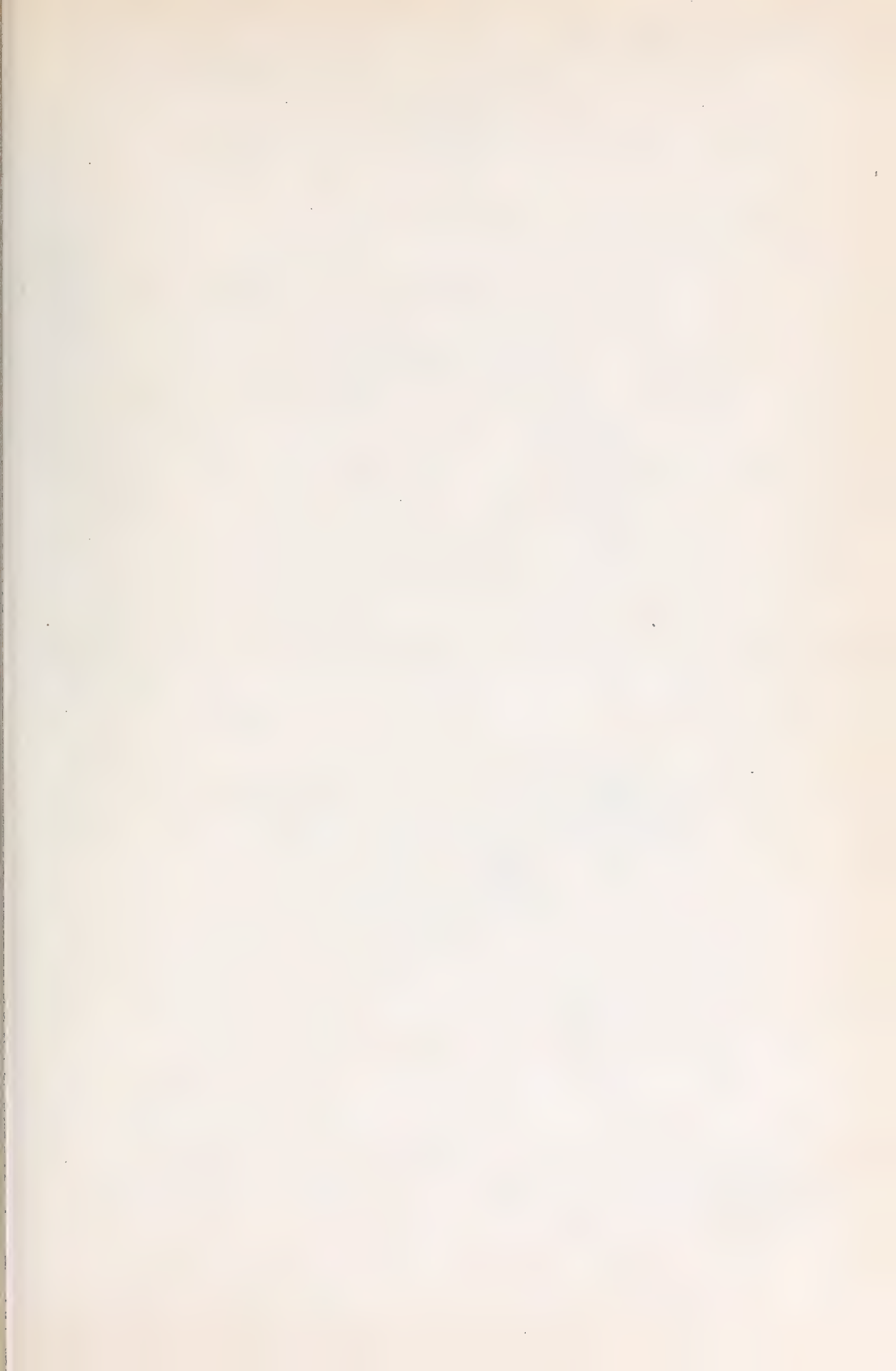
WILLIAM T. BAKER.

BENJAMIN F. CLAYTON.

Witnesses:

M. J. WILLIAMS,

WM. B. ZOELLER.



No. 674,575.

Patented May 21, 1901.

A. L. DUWELIUS.

PHONOGRAPH.

(Application filed June 20, 1898.)

(No Model.)

4 Sheets—Sheet 1.

Fig. 1.

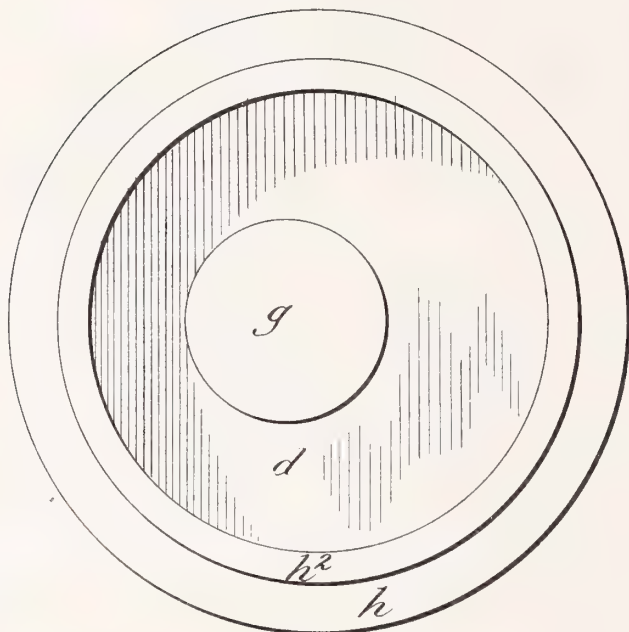
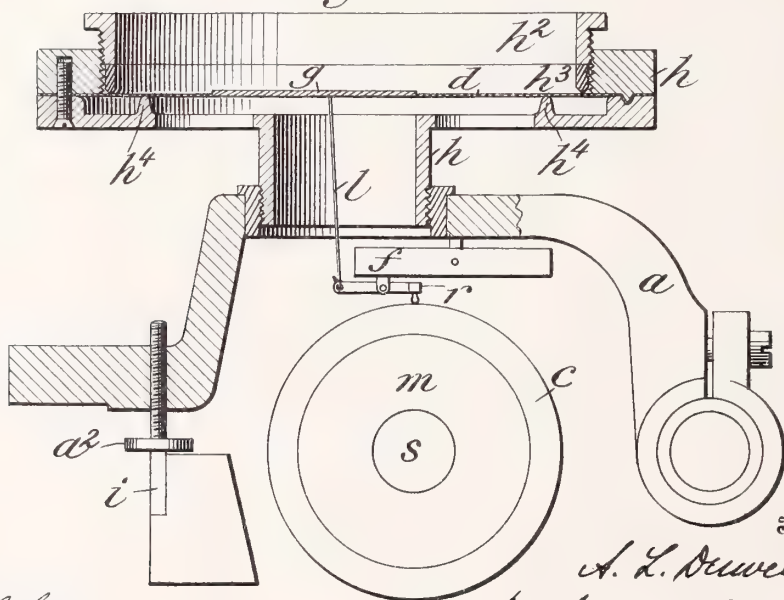


Fig. 2.



Witnesses

H. H. Schott
J. E. Hutchinson Jr.

Inventor

A. L. Duwelius,

by Annie Goldborough
Attorney S.

A. L. DUWELIUS.
PHONOGRAPH.

(Application filed June 20, 1898.)

(No Model.)

4 Sheets—Sheet 2.

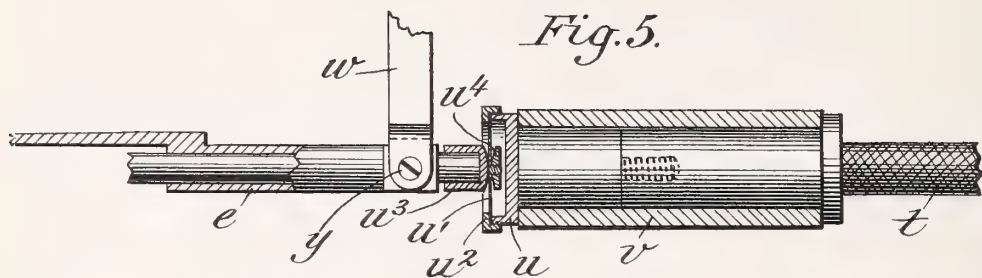
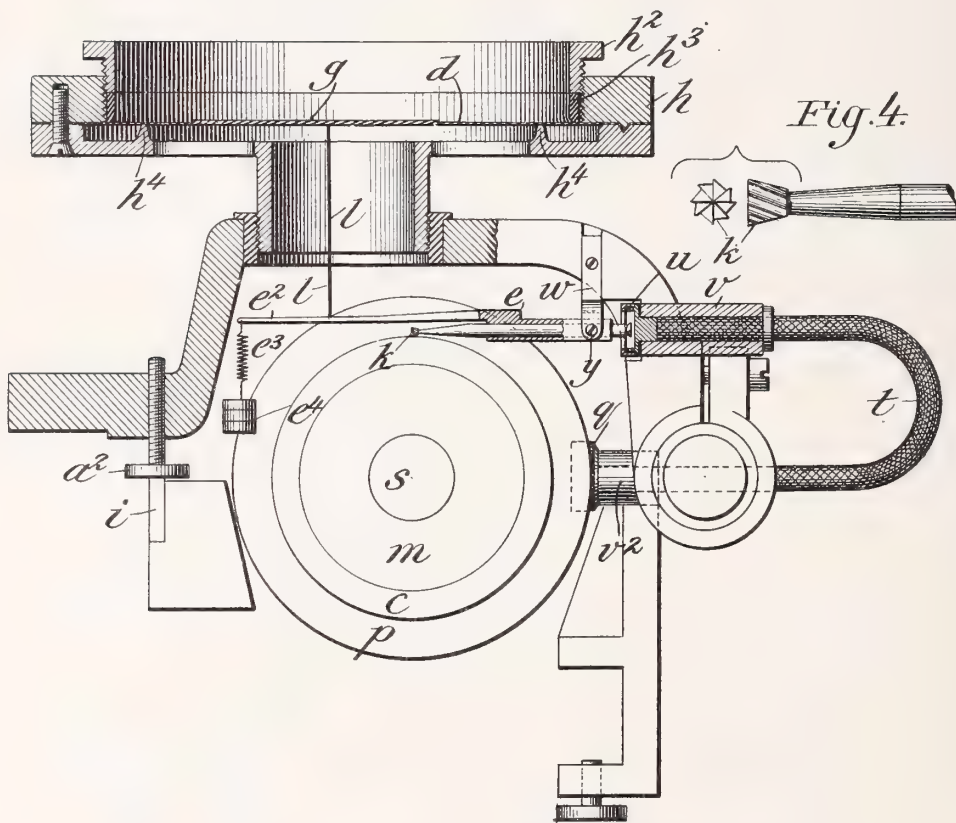


Fig. 3.



Witnesses:

D. W. Edelin.
J. E. Hutchinson Jr.

Inventor:

A. L. Duwelius,
by Lemue & Goldsborough,
Attys.

No. 674,575.

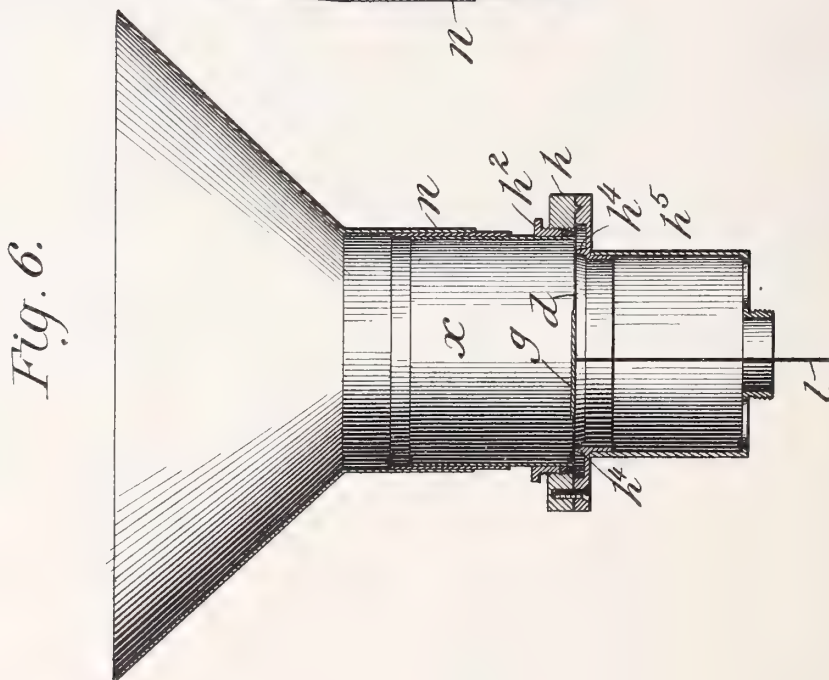
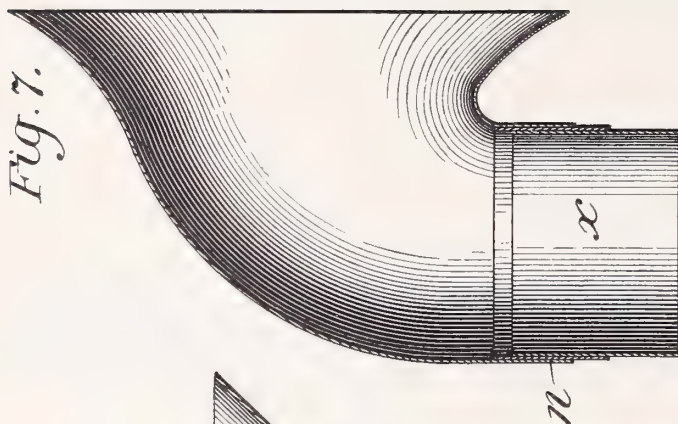
Patented May 21, 1901.

A. L. DUWELIUS.
PHONOGRAPH.

(Application filed June 20, 1898.)

(No Model.)

4 Sheets—Sheet 3.



Witnesses:

D. W. Edelin.
J. E. Hutchinson Jr.

Inventor:

A. L. Duwelius,
by Lemuel Goldborough,
Attys

No. 674,575.

Patented May 21, 1901.

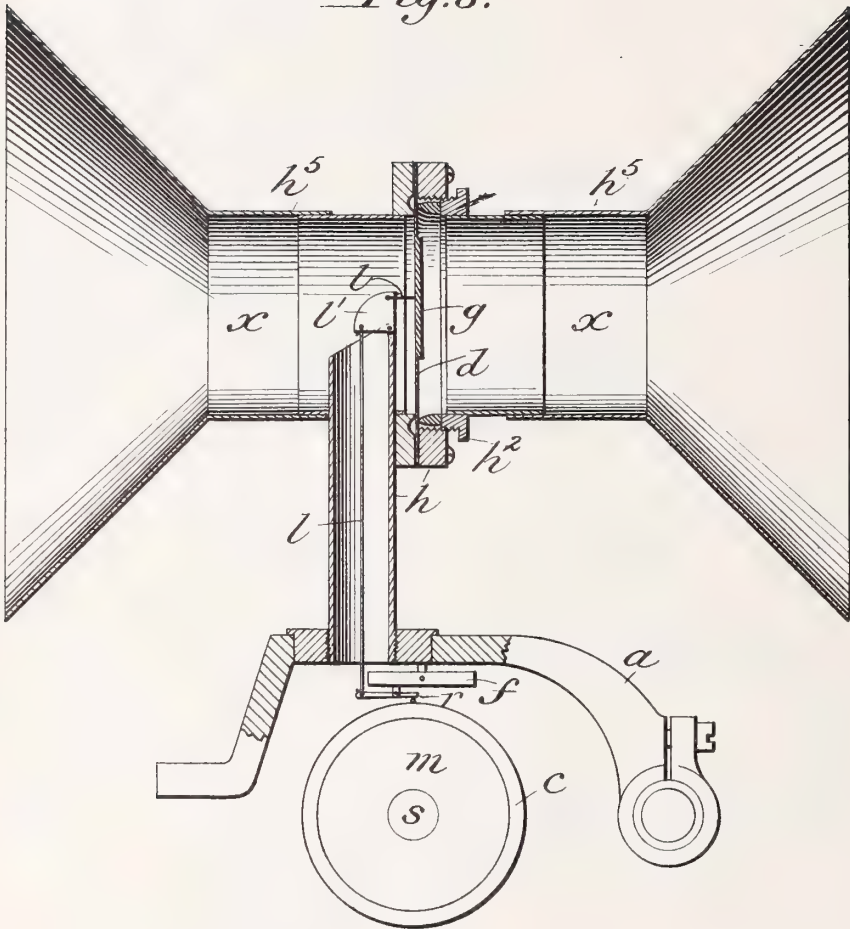
A. L. DUWELIUS.
PHONOGRAPH.

(Application filed June 20, 1898.)

(No Model.)

4 Sheets—Sheet 4.

Fig. 8.



Witnesses

H. H. Schott
J. L. Hutchinson Jr.

Inventor

A. L. Duwelius,
by Sumner Goldbraugh
Attorneys.

UNITED STATES PATENT OFFICE.

AUGUSTUS L. DUWELIUS, OF CINCINNATI, OHIO, ASSIGNOR TO ALFRED H. DUWELIUS AND WALTER S. DUWELIUS, OF SAME PLACE.

PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 674,575, dated May 21, 1901.

Application filed June 20, 1898. Serial No. 683,979. (No model.)

To all whom it may concern:

Be it known that I, AUGUSTUS L. DUWELIUS, a citizen of the United States, residing at Cincinnati, county of Hamilton, State of Ohio, have invented certain new and useful Improvements in the Art of Reproducing Sound; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to certain new and useful improvements in the art of reproducing sound; and it has for its object to provide means for obtaining a more nearly perfect reproduction of sound than has been heretofore attainable. I use the term "reproduction" in its general sense as including the entire operation of reproduction from the initial step of receiving and recording the sound to the final step of receiving and rendering it again audible.

It is well known that the loudness of sound produced by a vibrating diaphragm is dependent upon the amplitude of vibration of the diaphragm. Heretofore in the construction of sound-reproducing devices the practice has been in accordance with this law of physics to increase or diminish the amplitude of vibration of the receiving-diaphragm according as it was desired to increase or diminish the volume of the reproduced sound. I have discovered, however, that in dealing with complex sounds of varying volume, quality of tone or timbre, and distinctness of articulation—such, for instance, as the articulations of the human voice—better results are obtained by providing a diaphragm having a total mean effective area of not less than three and a half square inches. It has also been the general practice in the construction of the speaking-trumpets employed as sound-ducts between the diaphragm and the atmosphere to give them substantially the form of a cone terminating at its smaller end in a neck provided with a throat much smaller in area than the area of the diaphragm. I have found that much better results are obtained by providing a throat having an area of not less than nine-sixteenths of the area of the vibrating portion of the

diaphragm, and also that when the throat is so constructed as to admit of a variation of its length pleasing effects may be produced, sometimes to the extent of materially improving the reproduction of badly-recorded sound. I have further discovered that by providing a tubular extension to the reverse side of the diaphragm-holder the sonorousness of the apparatus may be still further increased. This circumstance I attribute to the fact that the tubular extension contains a relatively deep column of air, confined at the sides but, establishing practically-unobstructed communication between the diaphragm and the external air at the end of the tubular extension, that it acts as a resonator varying the sharpness or hollowness of the tone, and that it serves, in combination with the tubular extension or throat on the obverse side of the diaphragm, to establish sonorous zones or sound-waves remote from the apparatus by causing positive vibrations synchronous with the reciprocating movements of both sides of the diaphragm, and producing thereby positive alternate compressions and rarefactions of the atmosphere in contact with the tympanum of the ear. I have further discovered that by placing the diaphragm in a vertical position a more perfect reproduction of sound is obtained.

Another feature of my invention relates particularly to the recording step in the general operation of sound reproduction. Heretofore it has been customary to record the sound-vibrations upon a revolving cylinder or disk of wax or like material having a soft surface, through the agency of a gouge actuated by the diaphragm to produce indentations of varying depth corresponding to the diaphragm vibrations. Owing to the nature of the material employed in their construction, these record cylinders or disks are quite fragile, and the engraved records upon their surfaces are easily ruined by careless handling and have a comparatively short-lived usefulness under the best conditions. The softness of the material soon permits the sharpness of the indentations to become blunted, in consequence of which much detail is lost in the reproduction of the sound. I have devised a method through the agency

of which records of sound-waves may be engraved upon the surface of harder materials, such as metals, and their durability and consequent clearness greatly enhanced. This feature of my invention consists, generally speaking, in the employment of a revolving cutter or abrader guided and controlled by the vibrating diaphragm, so that the diaphragm instead of supplying the power necessary to engrave merely regulates the depth of the cut.

My invention is applicable generally to sound-reproducing devices, and particularly to the phonograph, graphophone, gramophone, and the like, as will be readily understood.

In the accompanying drawings, Figure 1 represents a plan view of my improved diaphragm and holder. Fig. 2 represents a sectional view of the diaphragm and holder and their adjuncts partly in elevation. Fig. 3 represents an end view, partly in section, of a phonograph equipped with my improved diaphragm and holder and record-engraving device. Fig. 4 represents, on a larger scale, one form of my revolving cutter-tool. Fig. 5 represents, in section and on a larger scale, the preferred means for connecting the shank of the revolving cutter with the flexible driving-shaft. Fig. 6 represents a central sectional view of my improved diaphragm and holder, the tubular extension, and the adjustable sound-duct. Fig. 7 represents a modified form of the sound-duct. Fig. 8 represents a form of my apparatus in which the diaphragm d and its holder h are employed in a vertical position, the connection with the links l being made through a bell-crank or angle lever l' , fulcrumed on the holder h . In the form shown sound-ducts with tubular throats x are applied to both sides of the diaphragm-holder.

Similar letters of reference indicate similar parts throughout the several views.

Referring to the drawings, and particularly to Figs. 1 and 2 thereof, s indicates the rotatory shaft of the phonograph, driven from any suitable source of power and provided with the customary mandrel m . c indicates the record-cylinder; r , the reproducing-stylus and fulcrumed carrier; f , the floating fulcrum and weight; a , the speaker-arm support; a^2 , the adjusting-screws, and I the rail upon which the adjusting-screws are adapted to ride. All of these parts being well known in the art, their construction and mode of operation will be readily understood.

Attached to the speaker arm or support a is shown my diaphragm-holder h , clamping the rim of the diaphragm d , the tension of which is regulated by the screw h^2 and washer h^3 , together with the circular bridge h^4 . On the face of the diaphragm d , but eccentric thereto, is shown the relatively non-flexible area g , connected with the stylus-carrier r by the link l . This non-flexible area may be produced by adding a stiff disk to either side

of the diaphragm, as shown, or may be produced by corrugating or embossing the diaphragm itself or by scoring it, or in many other ways and forms. The ratio of the non-flexible to the flexible area of the diaphragm will depend upon the nature of the materials employed, but should be as great as permissible in order to produce vibration over the largest area possible.

By locating the non-flexible area in a position eccentric to the main portion of the diaphragm the practical effect is to impart a different kind of movement thereto and to produce better results. Thus when so located the resistance to its movement becomes unequal and that portion of its periphery and surface nearest the edge or rim of the diaphragm offers the greatest resistance to motion and becomes relatively to a greater or less extent (depending upon the degree of eccentricity) a fulcrum. In other words, the non-flexible area becomes in effect a musical reed.

As shown in Fig. 6, the diaphragm-holder is preferably provided at the reverse side of the diaphragm with a tubular extension h^5 , serving as a resonator and containing a comparatively deep column of air in communication with the external atmosphere and confined at its sides. The sound-duct is provided with a throat x , preferably of approximately the same size as the diaphragm, but which should in any event not be less in area than nine-sixteenths of the vibrating portion of the diaphragm. In order to vary the effect, the neck n of the sound-duct is made adjustable in length, preferably by constructing it of a number of sections telescoping within one another. I have found by experiment that for most sounds a length of tube or throat approximately equal to its diameter is most desirable. In the form shown in Fig. 6 the sound-duct is adapted to project the sound vertically, while in the form shown in Fig. 7 it is intended to project the sound horizontally.

The means for obtaining the permanent record constituting a feature of my invention are illustrated in Fig. 3, one of the forms of cutting-tool or abrader being shown in Figs. 4 and 5. The cutting-tool k , which is designed to revolve rapidly, is journaled in a carrier e and is driven by a shaft s through the instrumentality of the friction-gears p q , the flexible shaft t , and the coupling u . The ends of the flexible shaft t are journaled in bearings v v^2 . The form of flexible coupling u shown consists of a flexible diaphragm u' , having its rim clamped in a recessed case u^2 , which is joined to and driven by the flexible shaft t . Attached to the center of this diaphragm by means of the nut u^4 is the tool-socket u^3 , through which the necessary engagement with the shank of the cutting-tool is made. The cutting-tool carrier e is trunnioned and is carried in the forked support w through the agency of the pointed screws y , which permit

it to move freely in a vertical direction, but prevent all horizontal movement. The tool-carrier e is provided with the extended arm e^2 , which through the link l makes connection with the diaphragm by which the vertical movement of the cutting-tool is controlled.

At the extreme end of the arm e^2 is shown connected therewith a spiral spring e^3 , carrying a suspended weight e^4 . The purpose of this combination of weight and spring is to furnish the necessary pressure to the cutting-tool responsively to the variations of the diaphragm d and to avoid "chattering." The maximum depth of cutting may be regulated by the screws a^2 . The angle of cutting may be altered, as required, by slightly withdrawing the bearing v and lowering the tool by means of the screw a^2 . The operation of the devices is such that the rotation of the cylinder c against the rapidly-revolving cutter k causes the surface of the cylinder to be scored to such depths as the variations of the diaphragm d , actuated by the impinging sound-waves, may permit.

Having thus described my said invention, what I claim is—

1. In a sound-reproducing apparatus, a vibratory diaphragm having a substantially non-flexible area eccentric thereto.

2. In a sound-reproducing apparatus, the combination with a vibratory diaphragm hav-

ing a non-flexible area eccentric thereto, of a sound-duct having an adjustable throat leading to said diaphragm.

3. In a sound-recording apparatus, the combination with a record-surface, a cutting or abrading tool rotatable on an axis substantially parallel to the direction of movement of said surface at the point of engagement with said tool, of means for rotating the same, and a diaphragm for vibrating and governing the depth of cut of the tool in accordance with the diaphragm vibrations.

4. In a sound-reproducing apparatus, the combination with a cutting or abrading tool, of means for rotating it, a vibratory diaphragm having a portion of inferior flexibility connected to said cutting or abrading tool to govern the depth of cut thereof.

5. In a sound-reproducing apparatus, the combination of a vibratory diaphragm having an area of inferior flexibility eccentric to the diaphragm as a whole, and an air-column chamber on the reverse side of said diaphragm.

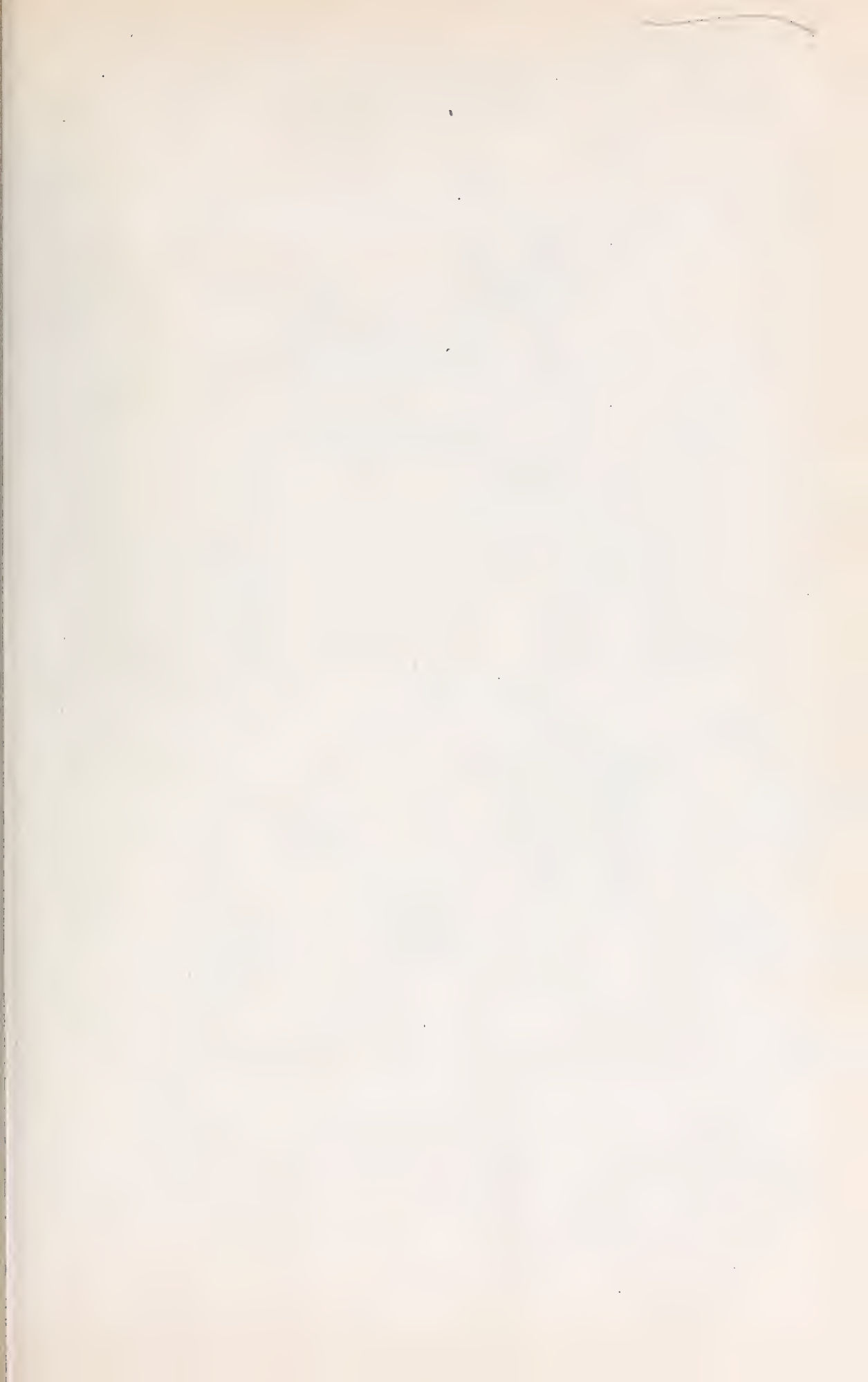
In testimony whereof I affix my signature in presence of two witnesses.

AUGUSTUS L. DUWELIUS.

Witnesses:

LEONARD W. GOSS,

ARCH. MIRRIELES.



E. R. JOHNSON.
SOUND RECORDING AND REPRODUCING DEVICE.

(Application filed Jan. 20, 1900.)

(No Model.)

Fig. 1.

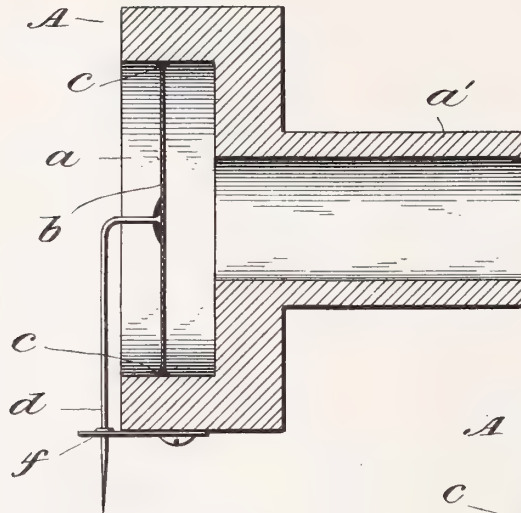


Fig. 2.

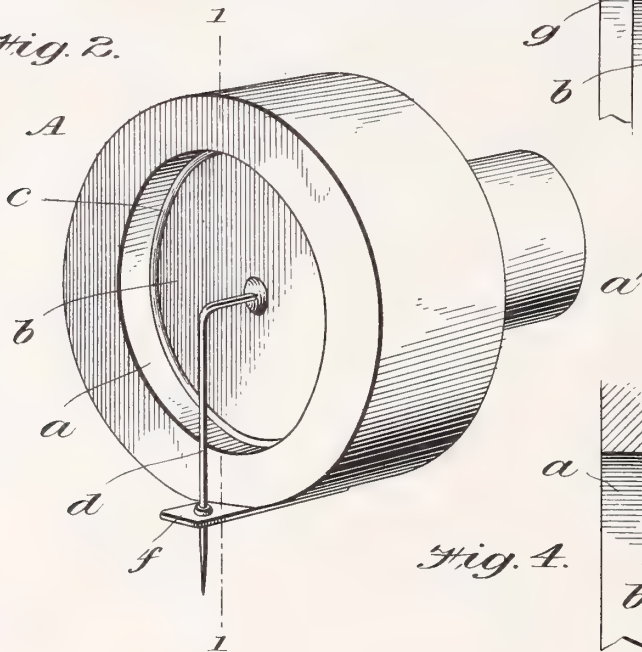


Fig. 3.

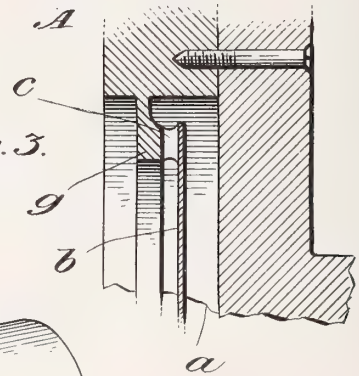
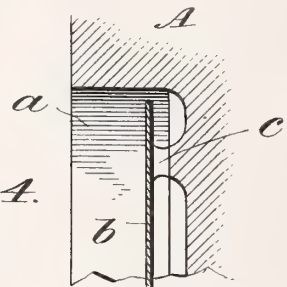


Fig. 4.



Inventor.

Eldridge R. Johnson.

by / John Pelt.
his Attorney.

Witnesses.

Geo. F. Cross
J. Henderson.

UNITED STATES PATENT OFFICE.

ELDRIDGE R. JOHNSON, OF PHILADELPHIA, PENNSYLVANIA.

SOUND RECORDING AND REPRODUCING DEVICE.

SPECIFICATION forming part of Letters Patent No. 675,331, dated May 28, 1901.

Application filed January 20, 1900. Serial No. 2,177. (No model.)

To all whom it may concern:

Be it known that I, ELDRIDGE R. JOHNSON, a citizen of the United States, and a resident of the city of Philadelphia, State of Pennsylvania, have invented a certain new and useful Improvement in Sound Recording and Reproducing Devices, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

My invention has relation to sound recording and reproducing machines; and it consists in the improvements hereinafter particularly described and claimed.

The object of my present invention is to improve the construction and arrangement of sound-boxes for recording and reproducing purposes. It has especial relation to the means for damping the diaphragm in the sound-box, and consists, essentially, in a liquid damper or film provided in contact with the diaphragm and with the adjacent walls of the sound-box casing.

As is well known, in order to produce efficient results dampers have been and are considered quite essential at or about the periphery of the diaphragm in sound recording and reproducing machines and are generally employed in the practical machines now in use and usually in the form of solid gaskets of rubber or other compressible material provided on one or both sides of the diaphragm. In my endeavors to improve the construction of the sound-box so as in the first place to produce upon the recording-tablet as nearly as possible a true record of the sound-waves such as impressed upon the diaphragm and to subsequently reproduce in clear audible tones the recorded sounds from the record I have discovered that a film of liquid provided about the periphery of the diaphragm may be employed with most successful results as a damping medium, the liquid forming what may be termed a "liquid" gasket, being held, preferably, about the peripheral portions of the diaphragm and to the adjacent walls of the sound-box casing in a thin body or film by capillary attraction or adhesion. In employing a liquid damper such friction as exists between the diaphragm and a compressible damper of solid material is reduced to a

minimum and the elasticity of the liquid, when properly applied, allows of the vibration of the diaphragm to any desirable practical extent without breaking the seal or film of the liquid.

The accompanying drawings illustrate sound-boxes embodying my present invention.

Figure 1 is a sectional view through the center of the sound-box on the lines 1 1 of Fig. 2. Fig. 2 is a front perspective view of the same. Fig. 3 illustrates another form of my invention. Fig. 4 illustrates still another form.

A represents the sound-box casing, having the usual recess portion *a*, which is connected with the sound receiving or transmitting tubular portion *a'*. The diaphragm *b* is located, as illustrated, in the recessed portion *a* and is of a diameter about equal to or slightly less than the diameter of the said recess. A body or film *c* of any suitable liquid is applied at or about the peripheral portion of the diaphragm *b* and is held by capillary attraction or adhesion thereto and to the immediately adjacent portion of the walls of the recess *a*, forming a thin film or body of liquid between such portion of the diaphragm and the adjacent portions of the walls of the recess in the nature of a liquid gasket. As illustrated in Fig. 1, the liquid is preferably applied to both faces of the diaphragm about the peripheral portion, also extending in a thin film between the peripheral edge of the diaphragm and the adjacent portions of the walls of the recess, thus connecting the main portions of the liquid film on each side of the diaphragm, though it is clear that the liquid damper may be, if desired, on one side only—as, for instance, in cases where the diaphragm fits very snugly at its periphery against the walls of the recess and in the arrangements shown in Figs. 3 and 4, though even in the case of the tight-fitting diaphragm the liquid film may be applied, if desired, to both sides of the diaphragm about its peripheral portions.

The damper need only be a very thin film of liquid, and no more liquid should be applied than may be readily held by capillary attraction or by adhesion. It may be applied by holding the sound-box, when the diaphragm

is in position, at a suitable angle and then introducing the liquid from an oiler or other convenient device around the edges of the diaphragm in a manner so that the liquid will at once be properly distributed and adhere to the peripheral portions of the diaphragm and to the adjacent portions of the walls of the recess, or it may be applied at one point when the sound-box is held at a desirable angle, and the diaphragm, if slightly loose, is then turned around in the casing, carrying the liquid with it about its peripheral portions, and by this means the liquid will be evenly distributed and applied and form the desirable film on both sides of the diaphragm. It is clear that the tendency of the liquid in being thus applied will be to intrude between the peripheral edges and the adjacent walls of the sound-box casing when the diaphragm is not a tight fit, and will thus form also the film on the inner face of the diaphragm and the walls of the casing adjacent to the peripheral portions.

It is apparent that the liquid film may be applied to the diaphragm at other portions than its periphery and may be connected with the interior wall of the casing indirectly instead of directly, and produce efficient results—as, for instance, through the medium of a ring or portion, such as *g* in Fig. 3, projecting from the walls of the casing and arranged adjacent to one or both of the faces of the diaphragm. In such case the liquid may be applied to the surface of the diaphragm and the film formed between it and the adjacent face of the ring depending portion *g*, as illustrated in Fig. 3. In such construction the liquid may be applied to the face of the diaphragm some distance from the periphery, as illustrated. Again, the liquid may be applied to the rear face of the diaphragm and attached to the inner rear wall of the recess—as, for instance, in the manner illustrated in Fig. 4. It is also clear that other forms of construction may be employed in carrying out my invention.

Different kinds of liquids may be employed, such as water and various kinds of oils, oil being preferable. Evaporation is, of course, constantly occurring, and therefore liquids which evaporate slowly are to be preferred. The liquid must be replenished from time to time as evaporation occurs.

The gasket or film of liquid applied in the manner herein described admits the diaphragm to vibrate freely throughout its entire area on account of the elasticity of the said liquid, while at the same time this liquid gasket, which is viscous to a certain extent, clings or adheres to the diaphragm and to the roof of the sound-box casing and acts as a damper to prevent the diaphragm from vibrating too freely, the capillary attraction or adhesive qualities of the liquid being suffi-

cient to prevent the diaphragm from breaking away from the liquid film.

A stylus-bar of any desired construction—such, for instance, as the stylus-bar *d* illustrated in the drawings—is connected with the diaphragm *b* and is supported in any desirable manner—as, for instance, by the support *f*, as illustrated in the drawings—the construction of the stylus and manner of support and connection being immaterial.

My invention herein described is adapted for both recording and reproducing purposes, though particularly important for recording purposes to produce primarily upon the recording tablet or material a record as nearly true as possible.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a sound recording and reproducing device, a vibrating diaphragm, and a liquid gasket for damping the vibrations of said diaphragm.

2. In a sound recording and reproducing machine, a sound-box casing, a diaphragm therein, and a liquid damper applied to the diaphragm adhering thereto and to a wall in the casing.

3. In a sound-box, a diaphragm therein, and a thin elastic liquid film, or gasket, adhering to said diaphragm and to the portion of the casing adjacent thereto by capillary attraction, substantially as described.

4. In a sound-box for sound recording and reproducing machines, a diaphragm mounted in said sound-box and a film of liquid provided about the peripheral portions of the diaphragm, said film adhering thereto and to the adjacent portions of the inner walls of the sound-box, substantially as described.

5. In a sound recorder or reproducer, a casing, a diaphragm therein and a liquid damper provided around the peripheral portion of the diaphragm adhering thereto and to the adjacent portions of the inner wall of the casing by capillary attraction, substantially as described.

6. In a sound-box, a casing, a diaphragm mounted therein of a diameter slightly less than the diameter of the recess in which it is mounted and a film of liquid damping material applied to the peripheral edge and to the opposite faces of the diaphragm about the periphery, said film being attached to the inner walls of the casing adjacent to the peripheral edges of the diaphragm, substantially as described.

In witness whereof I have hereunto set my hand this 6th day of January, A. D. 1900.

ELDRIDGE R. JOINSON.

Witnesses:

JNO. T. CROSS,
FRANK D. GRAHAM.



E. R. JOHNSON.
SOUND RECORDING AND REPRODUCING DEVICE.

(Application filed Jan. 20, 1900.)

(No Model.)

Fig. 1.

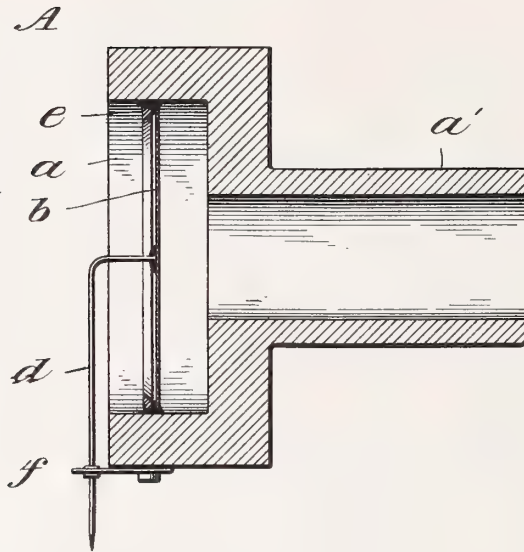


Fig. 2.

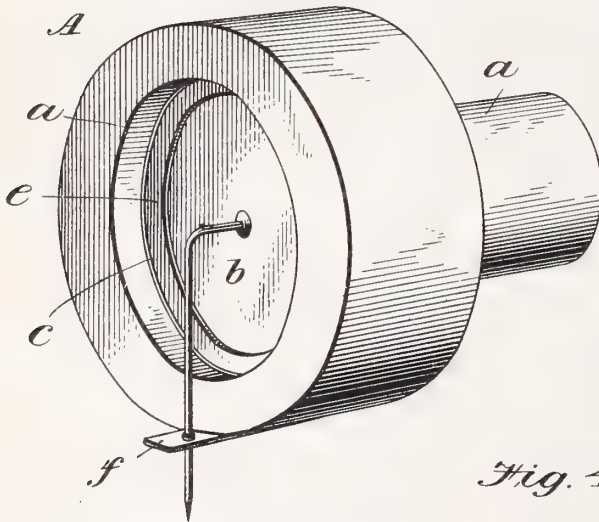


Fig. 3.

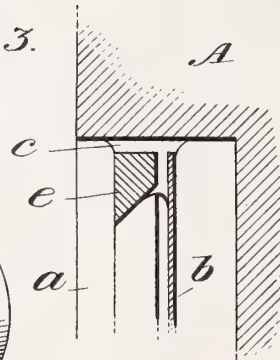
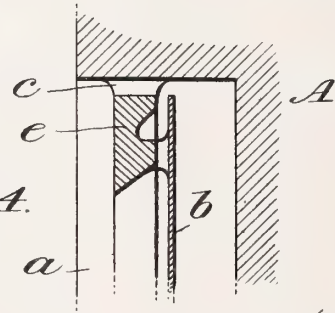


Fig. 4.



Inventor,

Eldridge R. Johnson,
by *Home P. Peck*,
his Attorney.

Witnesses.

Jno. T. Cross
J. H. Anderson

UNITED STATES PATENT OFFICE.

ELDRIDGE R. JOHNSON, OF PHILADELPHIA, PENNSYLVANIA.

SOUND RECORDING AND REPRODUCING DEVICE.

SPECIFICATION forming part of Letters Patent No. 675,332, dated May 28, 1901.

Application filed January 20, 1900. Serial No. 2,178. (No model.)

To all whom it may concern:

Be it known that I, ELDRIDGE R. JOHNSON, a citizen of the United States, and a resident of the city of Philadelphia, in the State of Pennsylvania, have invented certain new and useful Improvements in Sound Recording and Reproducing Devices, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

My invention has relation to sound recording and reproducing machines; and it consists in the improvements hereinafter particularly described and claimed.

My present invention relates to that class of sound-boxes in which a liquid damper or gasket is employed, as particularly set forth and described in my application for United States Letters Patent executed and filed of even date herewith.

One of the objects of my present invention is to provide a novel construction to allow the diaphragm to be adjusted back and forth in the recess of the sound-box, together with an adjustable ring or gasket which is connected with the diaphragm through the medium of a liquid film or damper and connected with the adjacent walls of the casing through the medium of a film of liquid.

Another object is to provide for the diaphragm an enlarged surface adjacent to the diaphragm for the liquid film or damper to adhere to, whereby an increased body of liquid may be maintained and supported by capillary attraction and at the same time the said enlarged surface be adjustable as the diaphragm is adjusted and moved through the medium of the intervening film.

In employing a liquid damper the friction such as usually exists, as where solid gaskets of rubber or other compressible materials are used, is reduced to a minimum, if not eliminated, and the elasticity of the liquid when properly applied allows the vibration of the diaphragm to any practical extent without breaking the seal or film of the liquid.

The accompanying drawings illustrate a sound-box for a sound recording and reproducing machine embodying my present invention.

Figure 1 is a sectional view through the center of the sound-box on the lines 1 1, Fig. 2.

Fig. 2 is a perspective view of the same. Fig. 3 is an enlarged detail view of Fig. 1. Fig. 4 is an enlarged detail view of a modification of the construction shown in Figs. 1 and 3.

A represents the sound-box casing, having the usual recessed portion *a*, which is connected with the sound receiving or transmitting tubular portion *a'*. The diaphragm *b* is located, as illustrated, in the recessed portion *a* and is of a diameter slightly less than the diameter of the said recess. Adjacent to the diaphragm *b*, though not in immediate contact therewith, is a ring or gasket *e*, preferably of metal, of a diameter about equal to the diameter of the diaphragm. A body or film *c* of any suitable liquid is applied at and about the peripheral portions of the diaphragm *b* and of the ring or gasket *e*. The gasket *e* presents an enlarged surface or face opposite the adjacent face of the diaphragm *b* for the liquid film or damper, which is applied to the face of the diaphragm to adhere to. Both the gasket *e* and the diaphragm *b* are out of contact with the inner walls of the recess and are free to move backward and forward in said recess as the diaphragm may from time to time require a backward or forward adjustment, which it frequently does on account of the stylus *d*, with which it is connected, requiring from time to time such adjustment in adapting it to or fitting it upon the record-tablet. The diaphragm also in this construction is free to vibrate as a whole approximately evenly throughout its entire area under the impulses of sound-vibrations. It is clear that the presence of the gasket *e*, as particularly shown in Fig. 3, affords an increased surface for the liquid damper, and consequently a larger quantity of liquid may be supported or suspended by adhesion or capillary attraction upon the diaphragm and gasket and the adjacent portion of the inner walls of the casing to which the film is attached. Therefore the film will not evaporate as quickly and will not require renewal as frequently as where a smaller quantity of liquid is employed. It is also clear that where a larger quantity of liquid may be employed the elasticity of the damper is somewhat increased and the to-and-fro adjustment of the diaphragm in the casing in a measure facilitated. The liquid may be applied to the

peripheral edges of the diaphragm and gasket and to one or both surfaces of each about its peripheries, as desired. No more liquid should be applied than such as may be readily supported upon the surfaces to which it is adapted. By holding the sound-box when the diaphragm is in position at a suitable angle the liquid may be readily applied from an oiler or other convenient device around the edges of the diaphragm in a manner so that it will at once properly adhere to the peripheral portions of the diaphragm and metal gasket and to the adjacent portions of the walls of the recess, or it may be applied at one point as the sound-box is held at a desirable angle and the diaphragm and metal gasket turned around in the casing-carrying the liquid with it about its peripheral portions, and thereby bringing it also in contact with the adjacent portions of the walls of the casing.

The liquid film or gasket being applied in the manner as above described will act as a damper to retard to a slight extent the vibrations of the diaphragm, while at the same time the yielding qualities of the liquid will permit said diaphragm to move freely under the action of the sound-waves. The edges or portions adjacent the edges of the diaphragm being immersed in the liquid and the diaphragm vibrating in said liquid will necessarily be dampened to a certain extent, and I have found this damping action to be highly beneficial in the production of records.

It is clear that the liquid damping material may be applied to one face of the diaphragm and to the adjacent face of the gasket *e*, and the gasket *e* in turn may be connected with the casing through the medium of the liquid film upon its peripheral portion—as, for instance, in the manner illustrated in Fig. 4. In this construction the liquid damper applied to the face of the diaphragm is not directly but only indirectly connected with the walls of the casing. The rings or gaskets *e* may be, if desired, applied in like manner on both sides of the diaphragm. It is clear that my present invention may also be embodied in other forms of construction.

A stylus-bar of any desired construction—such, for instance, as the stylus-bar *d* (illustrated in the drawings)—is connected with the diaphragm *b* and is supported in any desirable manner—as, for instance, by the support *f*, as illustrated in the drawings—the construction of the stylus and the manner of support and connection being immaterial.

Different kinds of liquids may be employed, such as water and various kinds of oils, oil being preferable.

My invention herein described is adapted both for recording and reproducing purposes, though it is particularly important for recording purposes in order to produce primarily upon the recording tablet or material a record as nearly true as possible.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a sound recording and reproducing machine, a sound-box casing, a diaphragm loosely mounted therein, and a sliding ring, or gasket, adjacent to said diaphragm, a liquid damper interposed between said diaphragm and gasket, said diaphragm and gasket being capable of to-and-fro motion within said casing, substantially as described.

2. In a sound-box for sound recording and reproducing machines, a diaphragm and gasket adjustable to and fro within the recess of the casing, and a film of liquid provided about the peripheral portions of said diaphragm and gasket and adhering to the inner walls of the casing by capillary attraction, substantially as described.

3. In a sound-box a diaphragm adjustable in the recess of the sound-box, a sliding gasket adjacent to said diaphragm, a film of liquid adhering to the adjacent faces of said diaphragm and gasket provided between the two and adhering to the adjacent portions of the walls of the casing, substantially as described.

4. In a sound-box for sound recording and reproducing machines, a sliding gasket provided in the recess of the casing, a film of liquid applied about the peripheral portions of said gasket adhering thereto and to the adjacent portions of the inner walls of the casing, a diaphragm adapted to slide within the recess of said casing for purposes of adjustment adjacent to said gasket and a liquid damper intervening between the said diaphragm and said gasket adhering to the surfaces thereof by capillary attraction, substantially as described.

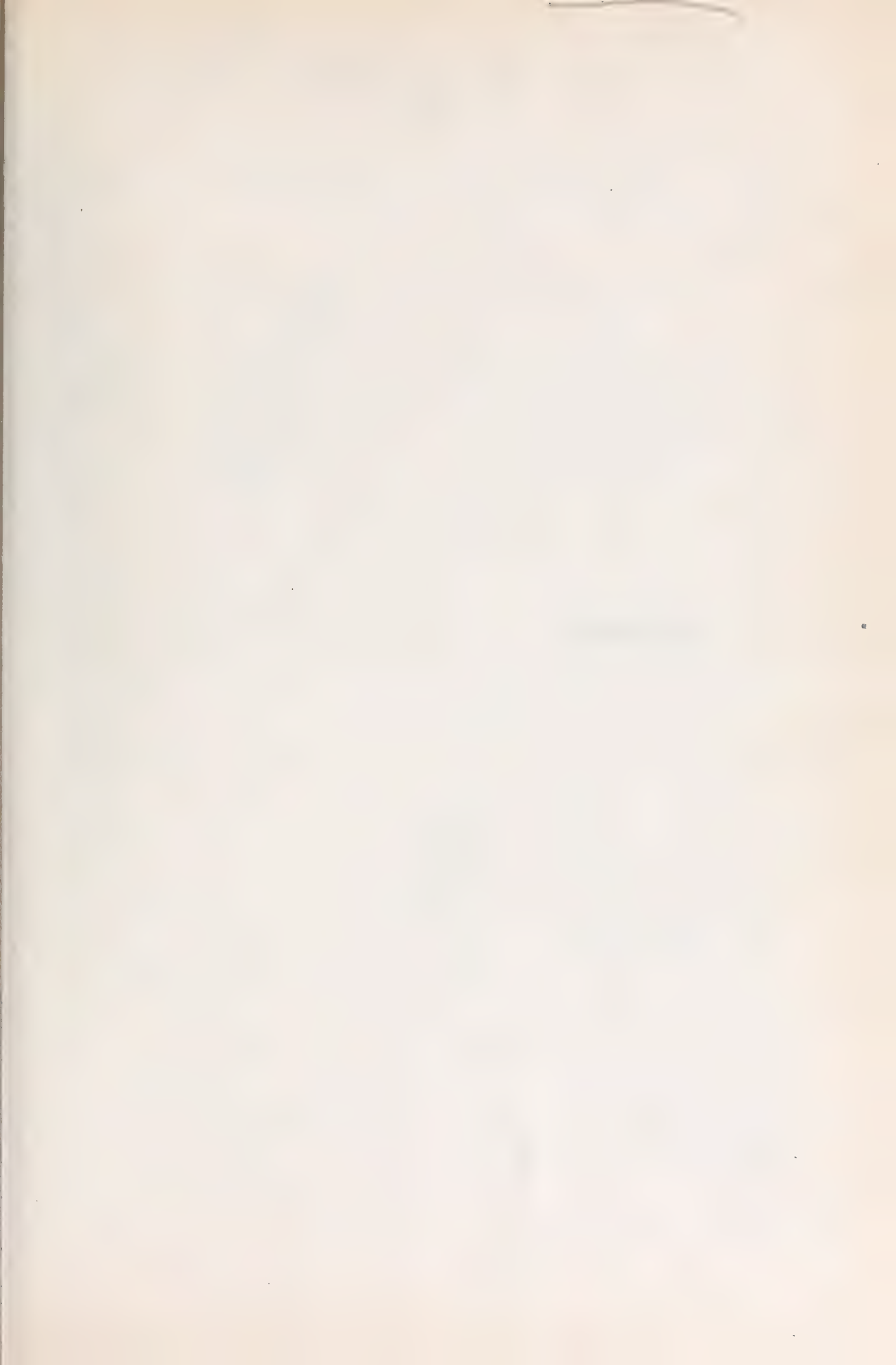
5. In a sound recording and reproducing machine, a loosely-mounted diaphragm and gasket adjustable within the recess of the sound-box and a film of liquid applied to said diaphragm and gasket at or near the peripheral portions thereof and to the adjacent portions of the inner walls of the casing, substantially as described.

In witness whereof I have hereunto set my hand this 6th day of January, A. D. 1900.

ELDRIDGE R. JOHNSON.

Witnesses:

JNO. T. CROSS,
FRANK D. GRAHAM.



No. 675,349.

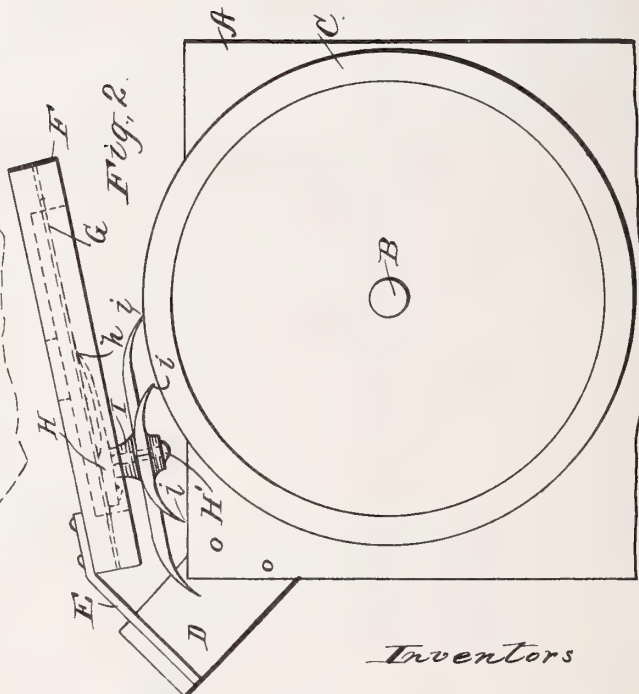
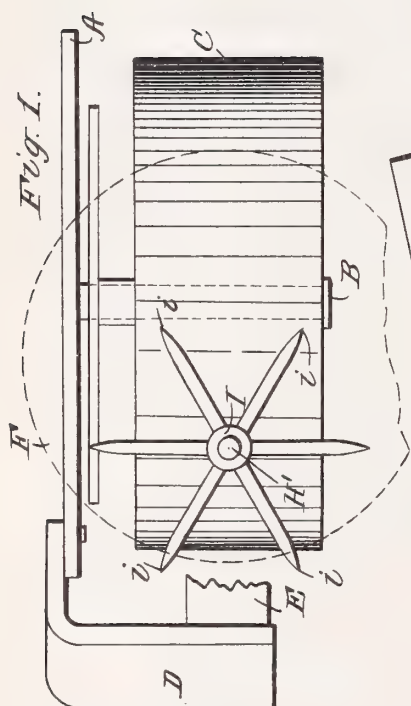
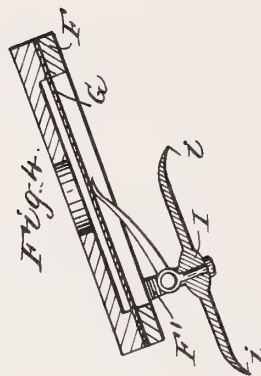
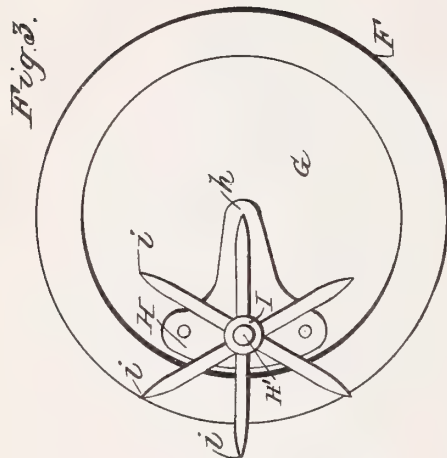
Patented May 28, 1901.

F. L. CAPPS & V. H. EMERSON.

GRAPHOPHONE.

(Application filed Feb. 18, 1901.)

(No Model.)



Witnesses
W. R. Earlen.
[Signature]

Inventors
F. L. Capps
V. H. Emerson
by [Signature] their attorneys

UNITED STATES PATENT OFFICE.

FRANK L. CAPPS AND VICTOR H. EMERSON, OF NEWARK, NEW JERSEY,
ASSIGNORS TO AMERICAN GRAPHOPHONE COMPANY, OF WEST VIRGINIA.

GRAPHOPHONE.

SPECIFICATION forming part of Letters Patent No. 675,349, dated May 28, 1901.

Application filed February 18, 1901. Serial No. 47,826. (No model.)

To all whom it may concern:

Be it known that we, FRANK L. CAPPS and VICTOR H. EMERSON, of Newark, New Jersey, have invented a new and useful Graphophone, which is fully set forth in the following specification.

This invention relates to talking-machines; and its object is to obtain repetition of the reproductions from a sound-record without requiring the reproducer to be moved back to the starting-point. It is particularly adapted for use with an inclosed graphophone, (or phonograph or gramophone,) as in a doll or other toy, where there would otherwise be need of an arm or lever projecting to the outside of the casing or of an opening into the casing for resetting the apparatus.

Our invention consists, in brief, of a plurality of reproducer-points having phonetic connection with a diaphragm or other sonorous or vibratile body and so constructed and arranged that they may be driven continually and always in the same direction without reversal along and in operative connection with the sound-record.

Our invention will best be understood in connection with the accompanying drawings, which illustrate one embodiment thereof.

Figure 1 is a plan view, the diaphragm-casing being removed, but its position indicated by dotted lines. Fig. 2 is a side view. Fig. 3 is an inverted view of the diaphragm-casing, and Fig. 4 is a sectional view of a modified form of device.

A represents a bracket or plate upon which is mounted the arbor B. Mounted revolvably on this arbor is a drum that carries a sound-record C. This record is preferably of celluloid or other durable material, and the drum may be rotated by clockwork or by a crank-arm or the like. An arm D, integral with or fast to bracket A, projects above or to one side of the drum and its record and carries the support E, preferably of spring material, to which is made fast the head F, as shown in Fig. 2. This head F supports in any desirable manner the diaphragm G. A shoe H is secured to the diaphragm, having a projection *h* extending to the center thereof and connected thereto or merely lying against it.

H' is a stud or arbor rising from the heel

of the shoe. On this stud is journaled the hub I of a spider, whose ends *i i*, &c., are turned down and pointed to constitute the reproducer-points. These arms of the spider are so arranged and so spaced that their points are a little nearer together than the combined transverse thickness width of all the record-grooves, whereby each succeeding reproducer-point will engage the record-groove before its predecessor has left its engagement therewith. The points engage the record-groove one after the other successively, so that as the drum and record are rotated continuously the groove of the record acts as a feed-screw, rotating the spider and giving a continued repetition of the reproductions from the record so long as the latter is revolving.

In Fig. 4 instead of having a shoe secured to the diaphragm it is mounted in trunnions F' upon the frame F, the mode of operation being of course the same.

It is obvious that many changes may be made in the details and operative devices without departing from the spirit of our invention. The latter is not limited to a cylindrical record or to one characterized by a radially-undulating groove. Again, instead of having the record-groove itself act as the feed-screw the spider or other device that constitutes (or carries) the plurality of reproducer-points may be caused to progress by means of some other feed-screw, it only being necessary that by some means the points be caused to have, one after the other, operative relation with a sound-record.

It will be noted that while the diaphragm casing or head F is preferably mounted on a spring-support to adjust itself automatically to any eccentricities of the record-cylinder C, yet it is otherwise stationary, and while the drum carrying the record C revolves or rotates, yet it has no shifting or translatory movement and is therefore stationary relative to the diaphragm. For these reason our invention is peculiarly adapted for use in a small inclosed space.

Having thus described our invention, we claim—

1. The combination with a sonorous or vibratory body, and a sound-record, of a sound-

transmitting device in phonetic connection with said sonorous body and carrying a plurality of reproducer-points that are arranged and adapted for successive engagement with
5 said record, whereby is obtained a repetition of the reproduction from said record without reversing said device, substantially as described.

10 2. The combination with a diaphragm and carrying an arbor or stud, of a plurality of reproducer-points journaled on said stud and adapted to engage in rotation with the groove of a sound-record, substantially as described.

15 3. The combination of a stationary diaphragm having a stud secured thereto, a relatively stationary but revoluble sound-record, and an intermediate sound-transmitting device journaled on said stud and having pho-
20 netic connection with said sound-record, substantially as described.

4. The combination with a stationary diaphragm and a relatively stationary but revoluble sound-record, of an intermediate sound-
25 transmitting device carrying a plurality of reproducer-points adapted and arranged to engage said record, one after the other, and follow or track throughout the same, substantially as described.

5. In a talking-machine, the combination 30 with a sound-record, of a plurality of revolubly-mounted reproducer-points adapted to engage automatically, one after the other, the groove of said record and be vibrated and rotated thereby, substantially as de- 35 scribed.

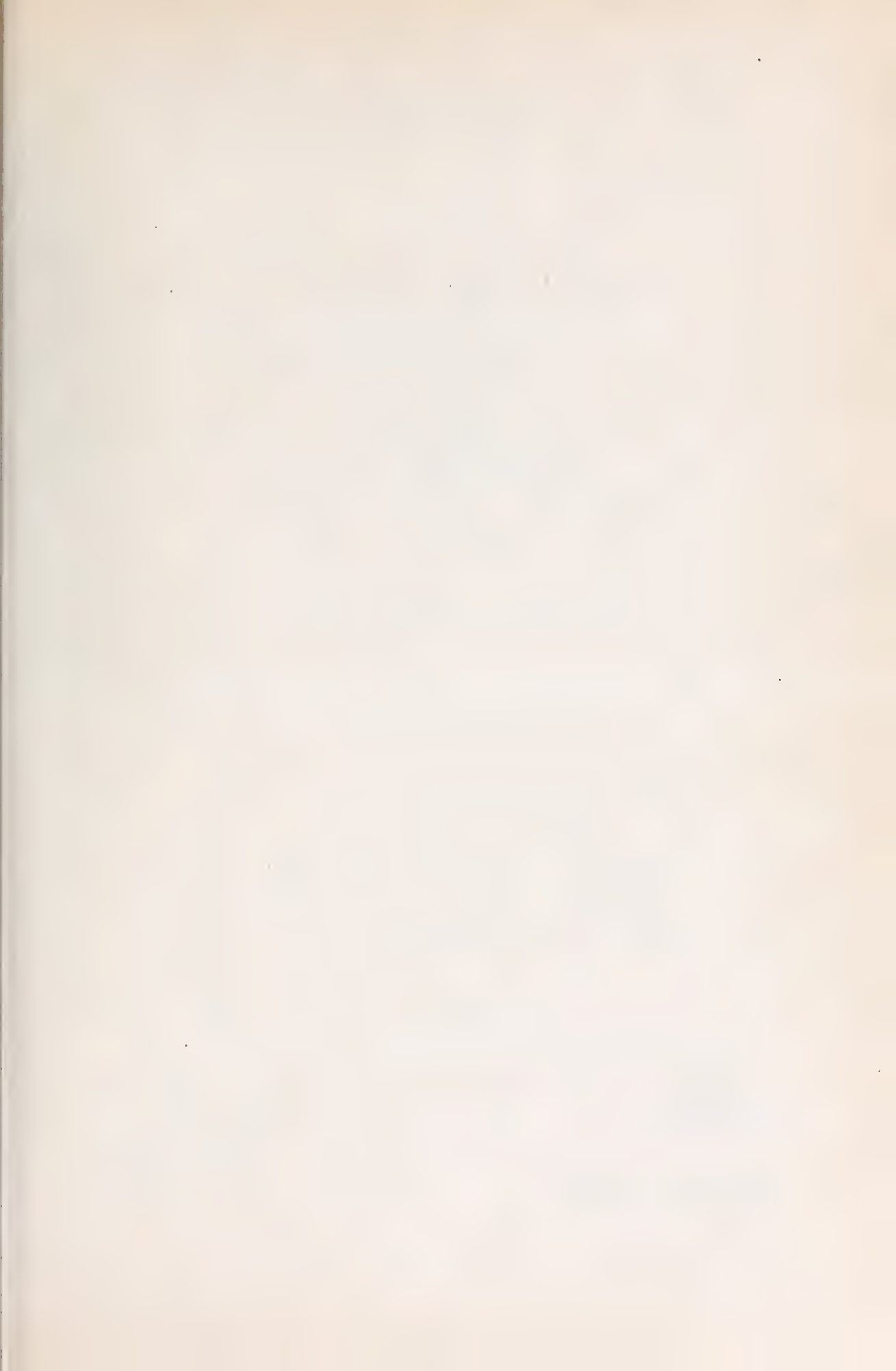
6. In a talking-machine, a revoluble device carrying a plurality of reproducer-points, and means for rotating the same to bring said points one after the other into operative re- 40 lation with a sound-record, whereby a repetition of the reproduction is obtained, substantially as described.

7. In a talking-machine, a sound-record, a plurality of reproducer-points, and means for 45 moving said record and for causing said points to travel continuously in the same direction, whereby is obtained a repetition of the reproduction, substantially as described.

In testimony whereof we have signed this 50 specification in the presence of two subscribing witnesses.

FRANK L. CAPPS.
VICTOR H. EMERSON.

Witnesses:
C. A. L. MASSIE,
JOHN DEVINE.



No. 676,106.

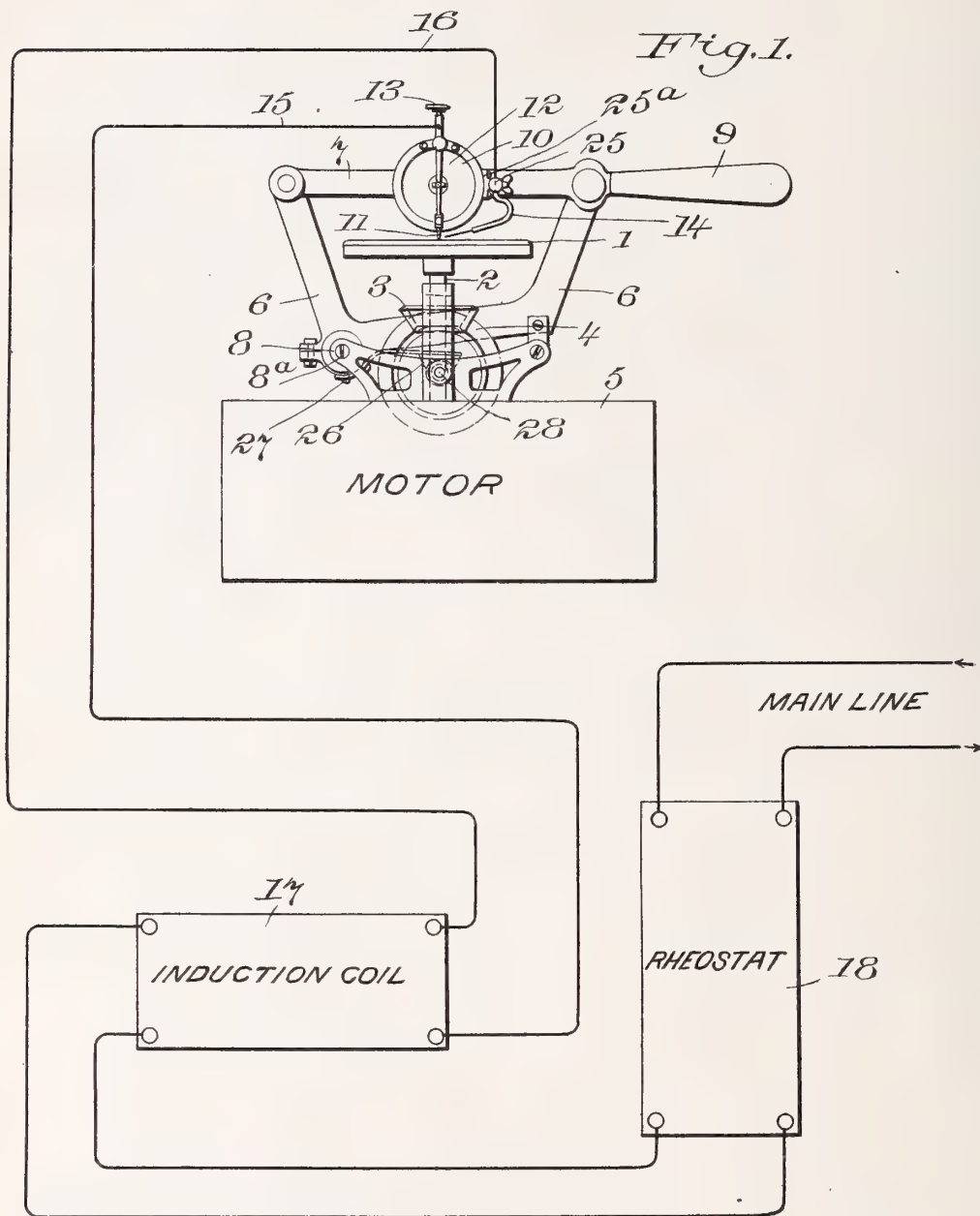
Patented June 11, 1901.

L. P. VALIQUET
SOUND RECORDING APPARATUS.

(Application filed June 8, 1899.)

(No Model.)

2 Sheets—Sheet 1.



WITNESSES:

W. H. Campbell

W. H. Campbell

INVENTOR

Louis P. Valiquet

BY

W. H. Campbell

ATTORNEY

No. 676,106.

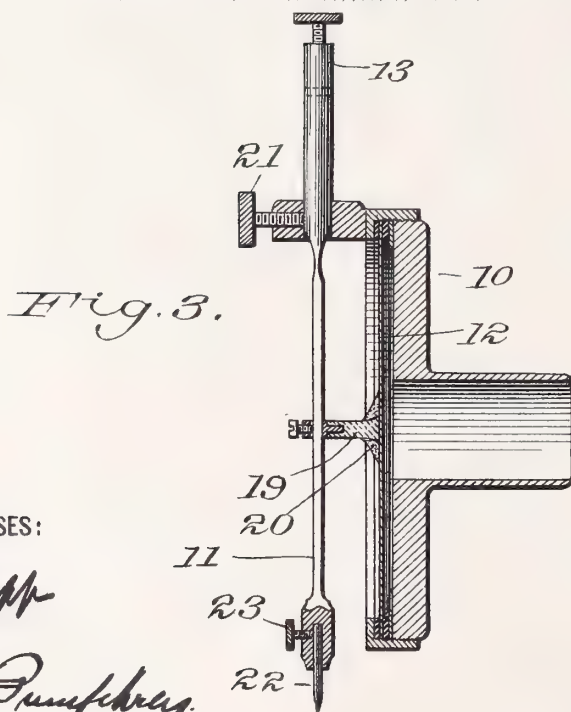
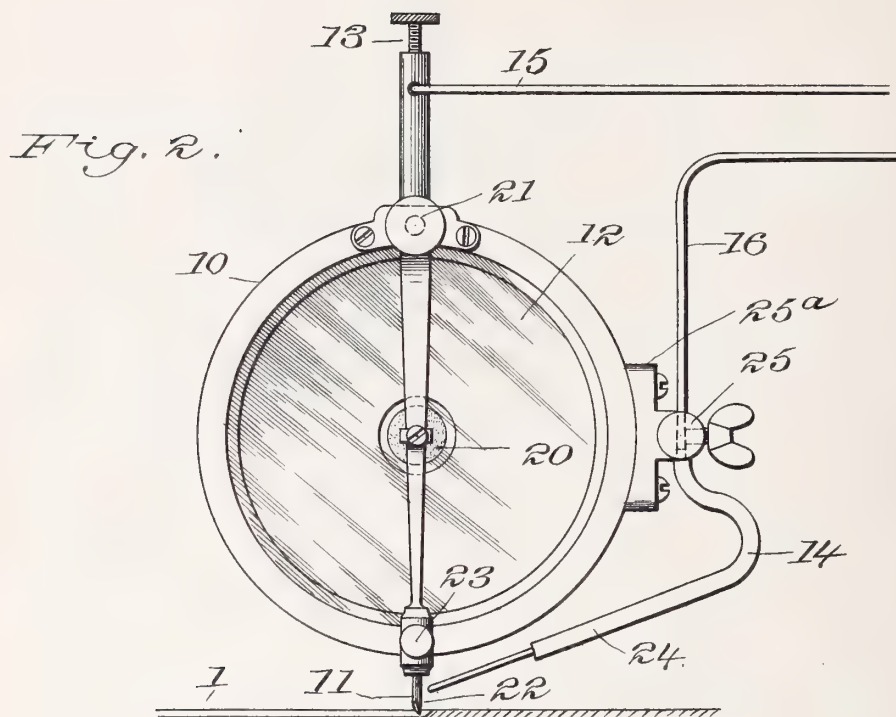
Patented June 11, 1901.

L. P. VALIQUET
SOUND RECORDING APPARATUS.

(Application filed June 8, 1899.)

(No Model.)

2 Sheets—Sheet 2.



WITNESSES:

P. B. B.

Mr. H. Humphrey.

INVENTOR

INVENTOR
Louis P. Valiquet

BY

BY *J. H. Permut*

ATTORNEY

UNITED STATES PATENT OFFICE.

LOUIS P. VALIQUET, OF NEW YORK, N. Y., ASSIGNOR TO THE UNIVERSAL TALKING MACHINE COMPANY, OF SAME PLACE.

SOUND-RECORDING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 676,106, dated June 11, 1901.

Application filed June 8, 1899. Serial No. 719,770. (No model.)

To all whom it may concern:

Be it known that I, LOUIS P. VALIQUET, a citizen of the United States of America, and a resident of New York city, county of New York, State of New York, have invented certain new and useful Improvements in Sound-Recording Apparatus and Methods, of which the following is a specification.

My invention relates generally to the art of recording vibrations in a suitable material which will retain an undulatory or other line representing said vibrations.

More specifically, my invention consists of an improved apparatus for recording sound-vibrations in a solid material, from which material or from a copy or negative of which said vibrations may be reproduced.

While my invention is applicable to all methods of sound-recording, whatever the character of the record-line to be produced, it produces the best results when employed in that method in which an undulatory line of even depth is produced by the sound-vibrations, such being the character of sound-record used with what is popularly known as the "gramophone."

One disadvantage heretofore resulting from the ordinary method of recording in various materials by etching with chemicals or by the use of a plain cutting-tool has been the roughened character of the surface of the groove so formed. These roughnesses occur not only in the sides of the undulatory groove of even depth, but also in the bottom of said groove, and as the reproducing-needle of the gramophone often rides upon the bottom of the groove these roughnesses in the surfaces produce the constant scratching or roaring sound in the reproducer, which is at times annoying and always tends in part to drown out the musical or other sounds which are being reproduced. My invention overcomes this difficulty by making the record-groove in a fusible material, which is caused to melt at the point of contact with the recording-needle by virtue of the heating of said needle. This needle and the material of the record-blank adjacent to the point of the needle I heat by application of the electric current, and I find the most convenient method of utilizing said electric current and localizing the necessary heat at the point of the needle, where it is to be

employed, is to produce a continuous succession of sparks from said needle, said sparks jumping from a point adjacent to its extremity to an adjacent electrode.

One form of apparatus for carrying out my above-described invention is illustrated in the accompanying two sheets of drawings, in which—

Figure 1 is a side elevation of the recording-machine with the electrical connections shown in diagram. Fig. 2 is an enlarged detail elevation of the recorder or sound-box. Fig. 3 is a central longitudinal section of the same.

Throughout the drawings like reference-figures refer to like parts.

A tablet 1, of fusible material, preferably one of the waxes or some wax-like compound or composition, is rotated by means of a vertical shaft 2, carrying the bevel-gear 3, meshing with the bevel-gear 4, operated by any suitable train of gearing from a motor, (not shown,) preferably concealed in the box 5. Projecting arms 6 6 from a swinging carriage sliding on guides on the main frame 8, in which the motor-gearing is journaled, carry the cross-piece 7', said swinging frame being pivoted to and sliding on the shaft or guide 8^a. The said swinging frame is controlled by the handle 9 and when in the position shown in Fig. 1 is caused to slide upon the shaft 8^a by means of a half-nut 26, carried by a projection 27, said half-nut gearing with a screw-thread 28 on the shaft of the bevel-gear 4, these parts being indicated in dotted lines in Fig. 1. The swinging frame carries the recorder 10, which has any suitable form of vibrating needle 11 phonetically connected with the diaphragm 12, the point of said needle projecting slightly below the surface of the tablet 1 when the recorder is in the position shown in Fig. 1.

Electrically connected with the vibrating needle 11 is the binding-post 13, to which one terminal 15 of an electric circuit is connected. An electrode 14, carried by binding-post 25, set in a piece of indurated fiber 25^a or other suitable insulation on the recorder, has its point arranged adjacent to the point of the vibrating needle 11. This electrode is connected with the other terminal 16 of the circuit. Preferably the induction-coil (represented at 17 diagrammatically) has its second-

ary in the circuit of the wires 15 and 16 and its primary controlled by a rheostat, (diagrammatically represented at 18,) the current being supplied from any convenient source of electrical power. As the vibrating needle 11 may become heated more or less, especially by the erroneous manipulation of the electrical apparatus, I prefer to employ some non-heat-conducting material—such as bone or similar material which is a good conductor of sound, while a bad conductor of heat—to furnish the connecting-piece 19 between the needle 11 and the diaphragm 12. This piece 19 may be positively attached to the diaphragm 12 by cement 20 or in any other convenient manner. The needle 11 is adjustably mounted on the recorder or sound-box by the set-screw 21 and preferably has a detachable tip 22, held by the set-screw 23. The electrode 14 may be made of any convenient shape; but I find that the end of an ordinary copper wire having the insulation 24 removed at the point will serve.

The mode of operation of the above-described apparatus when my method is employed is as follows: The record-tablet 1 is set in rotation by the motor 5, the recorder placed in the position shown in Fig. 1, and a feed motion radially of the tablet being given to the recorder by the feed-screw 28 and half-nut 26, as before described, the point of said needle traces a spiral line on the surface of the tablet 1. Direct electrical connections being established, the induction-coil 17 will cause a continuous series of sparks to pass from a point at or near the extremity of the needle-tip 22 to the electrode 14, thus heating the tip of the record-needle sufficiently to melt that portion of the wax-like tablet immediately in contact with it. It is evident, therefore, that the needle will melt out a fine spiral line in the revolving tablet 1. If then sound-waves produced by the voice or an instrument are sent into the sound box or recorder 10 and the diaphragm 12 vibrated thereby, said vibrations will be transmitted to the needle 11, and instead of tracing a true spiral the needle-point will trace an undulatory spiral line faithfully representing the sound-wave vibrations. As the hot needle leaves any particular part of the record the fused material will quickly solidify, so that the needle leaves behind it a groove having smooth walls and bottom in place of the rough and torn surfaces and ragged edges left by a cutting or tracing needle when working cold. When the record is completed, the swinging frame 7 is thrown up and the tablet removed and preferably copied in some harder material by electroplating or otherwise for purposes of reproduction.

The advantages of my invention consist in the smooth and even surface of the record-groove produced as above explained and also in the accuracy of the record, which arises from the fact that the needle has no mechanical work whatever to do in making the rec-

ord. The heat radiated from its point melts the fusible material of the tablet within a given distance of the needle, so that it need never touch the solid material, but travels always in a liquid or semiliquid mass produced by its own heat. Thus the needle is free to reproduce every slightest vibration given to the diaphragm, and said vibrations are neither restricted or distorted as, is the case where the recording-needle has to overcome a resistance presented by the recording material when a solid material.

It is evident, of course, that various changes could be made in the apparatus illustrated without departing from the spirit and scope of my invention, it being essential only that the recording-needle shall lie within the heating zone of an arc produced electrically.

Having therefore described my invention, what I claim as new, and desire to protect by Letters Patent, is—

1. The combination of the sound-box, the metallic recording-needle vibrated thereby, the electrode adjacent to but separated from the point of said needle, and an electric circuit whose terminals are connected to the needle and electrode respectively.

2. The combination of the sound-box, the metallic recording-needle vibrated thereby, the electrode adjacent to the point of said needle, and an electric circuit whose terminals are connected to the needle and electrode respectively, together with the heat-insulating material between the needle and the diaphragm of the sound-box.

3. The combination of the sound-box, the metallic recording-needle vibrated thereby, the electrode adjacent to but separated from the point of said needle, and an electric circuit whose terminals are connected to the needle and electrode respectively, together with the rotating tablet of fusible material in contact with the point of the needle.

4. The combination of the sound-box, the metallic recording-needle vibrated thereby, the electrode adjacent to but separated from the point of said needle, and an electric circuit whose terminals are connected to the needle and electrode respectively, together with the rotating tablet of fusible material in contact with the point of the needle, and the swinging frame on which both sound-box and electrode are mounted.

5. The combination of the sound-box, the metallic recording-needle vibrated thereby, the electrode adjacent to but separated from the point of said needle, and an electric circuit whose terminals are connected to the needle and electrode respectively, together with an induction-coil, the secondary of which is included in said electric circuit.

Signed by me at New York city this 6th day of June, 1899.

LOUIS P. VALIQUET.

Witnesses:

LILIAN FOSTER,
W. H. PUMPHREY.



No. 676,III.

J. W. AYLSWORTH.
PHONOGRAPHIC RECORD BLANK.

Patented June 11, 1901.

(No Model.)

Stearate of soda
Palmitate of soda
Stearate of lead
Palmitate of lead
Oleate of lead
Colophony
Ceresin

Witnesses:

James P. Coleman
Archibald G. Rose

Inventor

Jonas Walter Aylsworth
by *Dyer Edmund Dyer*
Att'ys.

UNITED STATES PATENT OFFICE.

JONAS WALTER AYLSWORTH, OF EAST ORANGE, NEW JERSEY, ASSIGNOR TO
THE NATIONAL PHONOGRAPH COMPANY, OF ORANGE, NEW JERSEY.

PHONOGRAPHIC RECORD-BLANK.

SPECIFICATION forming part of Letters Patent No. 676,111, dated June 11, 1901.

Application filed August 11, 1900. Serial No. 26,643. (No specimens.)

To all whom it may concern:

Be it known that I, JONAS WALTER AYLSWORTH, a citizen of the United States, residing at East Orange, in the County of Essex and State of New Jersey, have invented a certain new and useful Improvement in Phonographic Record-Blanks, of which the following is a description.

My invention relates to improvements in compositions for phonographic record-blanks; and my object is to secure a composition by which blanks of superior quality to those now in use can be produced, while the cost of such blanks will be materially reduced.

In the accompanying drawing I illustrate a perspective view of a phonograph-blank, indicating thereon the preferred combination of ingredients therefor.

My improved composition for phonographic record-blanks consists of an alkaline soap of higher fatty acids of the acetic series—as, for example, a stearate or palmitate, or both, of an alkali, such as soda—a lead soap of higher fatty acids of the acetic series—as, for example, a stearate or palmitate, or both, of lead—oleate of lead, a resinous substance—such as colophony, gum-copal, gum-kauri, &c.—and preferably a hydrocarbon—such as paraffin, ozocerite, ceresin, &c.—as indicated in the drawing. The stearic acid of commerce, from which stearate of lead and stearate of soda are made, is composed of a mixture of stearic acid and palmitic acid, so that the products secured therefrom comprise a mixture of stearate and palmitate of lead or soda, as the case may be. For cheapness of manufacture, therefore, I prefer to manufacture stearate and palmitate of lead or soda from the ordinary stearic acid of commerce, and therefore the most economical composition of my present invention is one utilizing both stearate and palmitate of lead and soda. It is to be understood, however, that a composition is within the scope of my present invention if it utilizes either stearate or palmitate of lead or of soda or any desired combination of such products.

Proportions with which I have secured ex-

cellent results are the following: ninety-six parts, by weight, of stearate and palmitate of soda, containing about 6.9 parts of sodium oxid, (Na_2O ;) seventy-three parts, by weight, of stearate and palmitate of lead, containing about twenty-one parts of lead oxid, (PbO ;) nine parts, by weight, of oleate of lead, containing about 2.5 parts lead oxid; ten parts, by weight, colophony; two parts, by weight, ceresin. These proportions may be varied considerably without departing from the spirit of my invention. For instance, the ceresin may be omitted entirely if it is desired to produce a harder composition, and the proportion of oleate of lead may be reduced to attain the same end.

The resulting blanks are absolutely non-crystalline in character, hard, perfectly smooth, and more or less transparent.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is as follows:

1. A composition for phonograph record-blanks, comprising an alkaline soap of higher fatty acids of the acetic series, a lead soap of higher fatty acids of the acetic series, oleate of lead and an acid resin, substantially as set forth.

2. A composition for phonograph record-blanks, comprising soda soap of higher fatty acids of the acetic series, lead soap of higher fatty acids of the acetic series, oleate of lead and an acid resin, substantially as set forth.

3. A composition for phonograph record-blanks, comprising an alkaline soap of higher fatty acids of the acetic series, a lead soap of higher fatty acids of the acetic series, oleate of lead, an acid resin, and a hydrocarbon, substantially as set forth.

4. A composition for phonograph record-blanks, comprising soda soap of higher fatty acids of the acetic series, lead soap of higher fatty acids of the acetic series, oleate of lead, an acid resin, and a hydrocarbon, substantially as set forth.

5. A composition for phonograph record-blanks, comprising stearate and palmitate of soda, stearate and palmitate of lead, oleate of

lead, and an acid resin, substantially as set forth.

5 6. A composition for phonograph record-blanks, comprising stearate and palmitate of soda, stearate and palmitate of lead, oleate of lead, an acid resin, and a hydrocarbon, substantially as set forth.

This specification signed and witnessed this 25th day of July, 1900.

JONAS WALTER AYLSWORTH.

Witnesses:

J. F. RANDOLPH,

J. A. BOEHNE.



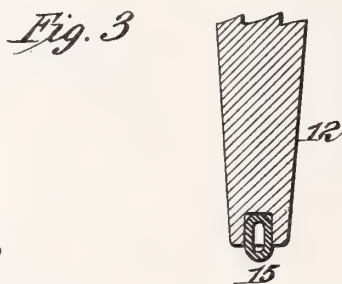
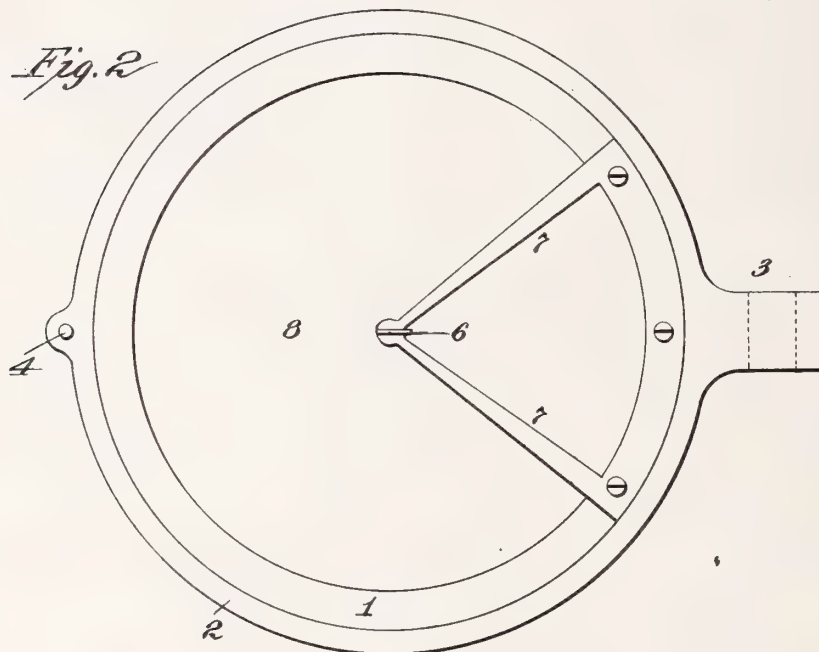
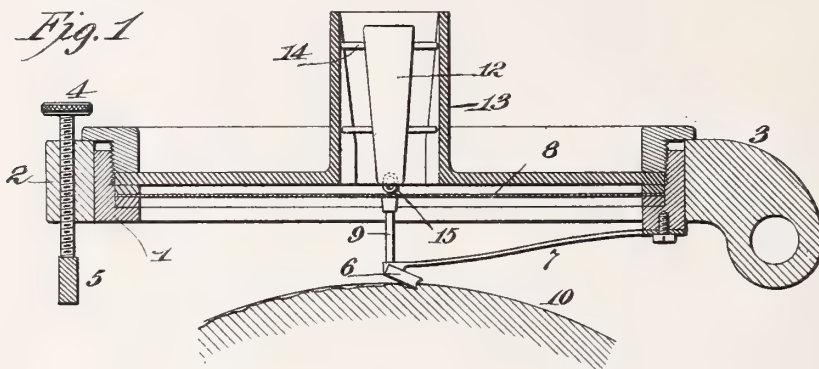
No. 676,225.

Patented June 11, 1901.

T. A. EDISON.
PHONOGRAPHIC RECORDING APPARATUS.

(Application filed Aug. 18, 1900.)

(No Model.)



Witnesses:

Geo. F. Coleman
Archibald G. Rose

Inventor

Thomas A. Edison
by *Stuart Edmunds* *Stuart*

Att'ys.

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

PHONOGRAPHIC RECORDING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 676,225, dated June 11, 1901.

Original application filed March 17, 1899, Serial No. 709,448. Divided and this application filed August 18, 1900. Serial No. 27,238. (No model.)

To all whom it may concern.

Be it known that I, THOMAS A. EDISON, a citizen of the United States, residing at Llewellyn Park, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Phonographic Recording Apparatus, (Case No. 1,046,) of which the following is a description.

My invention relates to improvements in apparatus for making phonographic records, and the present application is a division of an application for Letters Patent of the United States filed by me on March 17, 1899, Serial No. 709,448. In said application I describe generally such an arrangement of the diaphragm or other element influenced or vibrated by the sound-waves as to normally relieve it of all or substantially all stress, whereby it will be maintained in substantial equilibrium and will be more sensitively receptive and more accurately responsive to sound-vibrations. The present invention relates to a phonographic recorder of this type, and specifically to a phonographic recorder of the kind wherein the usual compensating weight is dispensed with and the cutting or recording tool is caused to engage the record-surface by a direct manual adjustment.

The object of my present invention is to so construct or arrange the diaphragm of manually-adjusted phonographic recorders as to relieve the diaphragm of all or substantially all stress now resulting from the pressure necessary to properly engage the cutting or recording tool with the record-surface to the requisite depth.

In order that the invention may be better understood, attention is directed to the accompanying drawings, forming part of this specification, and in which—

Figure 1 is a section through a phonographic recording device of the type described, illustrating my present improvements applied thereto; Fig. 2, a bottom view of Fig. 1, and Fig. 3 an enlarged sectional view of the lower portion of the compensating weight.

In all of the above views corresponding parts are represented by the same numerals of reference.

The casing 1 is carried in a ring 2, formed in a pivoted arm 3, having an adjusting-screw 4, which works on the usual longitudinal slide 5. The cutting or engraving tool 6 is carried on the end of spring-arms 7 7 (shown more clearly in Fig. 2) and is connected with the center of the diaphragm 8 by a connection 9, made, preferably, of wood. In use the adjusting-screw 4 is turned until the cutting or engraving tool 6 engages the proper depth into the recording-surface 10. This obviously places the diaphragm 8 under stress, or, in other words, tends to buckle it upwardly, preventing accurate response thereof to the vibrations. With this type of recorder in order that my invention may be carried out a weight is preferably employed to counteract this upward stress of the diaphragm. This counteracting-weight 12 is located, preferably, in the nipple 13, to which the speaking-tube is connected, being guided by the arms 14 and having a recess at its lower end, in which is placed, preferably, a section of rubber tubing 15, (see Fig. 3,) which bears upon the center of the diaphragm 8. The mass of the weight 12 is sufficient to substantially counteract the upward stress exerted upon the diaphragm by the engagement of the cutting or engraving tool with the recording-surface. By employing the elastic buffer 15 between the diaphragm 8 and the weight 12 the effect of the weight will be exerted at all times upon the diaphragm, even though the vibrations are so rapid that the weight cannot respond thereto.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is as follows:

1. In a phonograph-recorder, the combination with the recording-diaphragm, of a counteracting-weight loosely and bodily carried thereby, substantially as set forth.

2. In a phonograph-recorder, the combination with the recording-diaphragm, of a counteracting-weight bodily carried thereby, and an elastic connection between the weight and diaphragm, substantially as set forth.

3. In a phonograph-recorder, the combination with the recording-diaphragm, the recording-tool directly connected thereto, and means

for manually adjusting the diaphragm, of a counteracting-weight carried loosely and bodily by the diaphragm, substantially as set forth.

5 4. In a phonograph-recorder, the combination with the recording-diaphragm, the recording-tool directly connected thereto, and means for manually adjusting the diaphragm, of a counteracting-weight carried bodily by the
10 diaphragm, and an elastic connection between said weight and diaphragm, substantially as set forth.

15 5. In a phonograph-recorder, the combination with the recording-diaphragm and its inclosing casing, of a counteracting-weight carried bodily by the diaphragm and vertically

movable within said casing, substantially as set forth.

6. In a phonograph-recorder, the combination with the recording-diaphragm and its inclosing casing, of a counteracting-weight carried bodily by the diaphragm and vertically movable within said casing, and guiding-arms for guiding said weight in said casing, substantially as set forth. 20 25

This specification signed and witnessed this 10th day of August, 1900.

THOS. A. EDISON.

Witnesses:

J. F. RANDOLPH,

J. A. BOEHME.



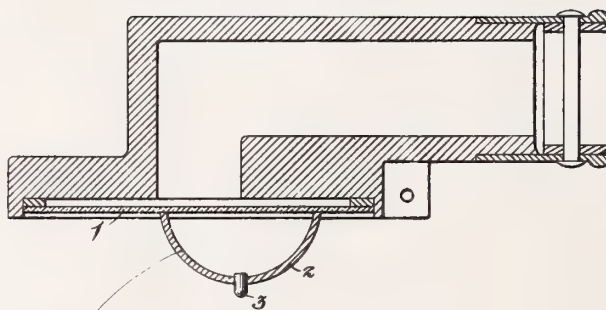
No. 676,270.

Patented June 11, 1901.

I. W. NORCROSS, JR.
PHONOGRAPH OR GRAPHOPHONE REPRODUCER.

(Application filed Nov. 26, 1900.)

(No Model.)



Attenuator

Witnesses

*Herman C. Mettles,
Frank L. Graham.*

Inventor

*Isaac W. Norcross Jr.
by his Attorneys
Hewson & Houson*

UNITED STATES PATENT OFFICE.

ISAAC W. NORCROSS, JR., OF NEW YORK, N. Y., ASSIGNOR TO THE HAWTHORNE AND SHEBLE MANUFACTURING COMPANY, OF PHILADELPHIA, PENNSYLVANIA.

PHONOGRAPH OR GRAPHOPHONE REPRODUCER.

SPECIFICATION forming part of Letters Patent No. 676,270, dated June 11, 1901.

Application filed November 26, 1900. Serial No. 37,787. (No model.)

To all whom it may concern:

Be it known that I, ISAAC W. NORCROSS, Jr., a citizen of the United States, and a resident of New York city, New York, have invented certain Improvements in Phonograph or Graphophone Reproducers, of which the following is a specification.

The object of my invention is to provide the reproducer of a phonograph or graphophone instrument with an attachment whereby the reproductions are improved both in volume and distinctness of tone.

The accompanying drawing shows a longitudinal section, on an exaggerated scale, of a graphophone-reproducer made in accordance with my invention.

So far as the general construction of the reproducer is concerned it may be similar to those now in use, my invention consisting of an attachment to the diaphragm 1 of the reproducer whereby the vibrations of said diaphragm under the action of the record are so affected as to materially improve the result. This attachment consists of a hollow boss 2, applied to the lower face of the diaphragm 1 and carrying a reproducer-point 3 similar to that which is ordinarily attached directly to the reproducer-diaphragm. The hollow boss 2 may be of cup-like or inverted-conical form and may be composed of any material found to be available for the purpose, aluminium being preferred. Owing to the extended area of contact of the hollow boss 2 with the diaphragm 1 the vibrations of the latter are so much improved as compared with those of a diaphragm having the reproducer-point applied directly to the same that better reproductions are obtained both as regards volume

and distinctness of tone, the curved form of the boss 2 rendering it so stiff that there is no springing of the same, the undulations of the record being transmitted to the diaphragm without any loss in extent of vibration of the diaphragm due to the interposed transmitter.

I am aware that it has been proposed to provide a sound-recorder with a conical diaphragm having around the enlarged end of the cone a projecting flange, whereby said cone is secured to the holder; but my invention is distinct from this in having the ordinary flat diaphragm, the purpose of my invention being to transmit to such flat diaphragm more effectively than usual the vibrations due to the passage of the undulating record beneath the reproducer-point.

The hollow boss will be located on the diaphragm in such position as will give the best result. As shown in the drawing, it is located somewhat off center longitudinally, this position having been found in practice to be a good one.

Having thus described my invention, I claim and desire to secure by Letters Patent—

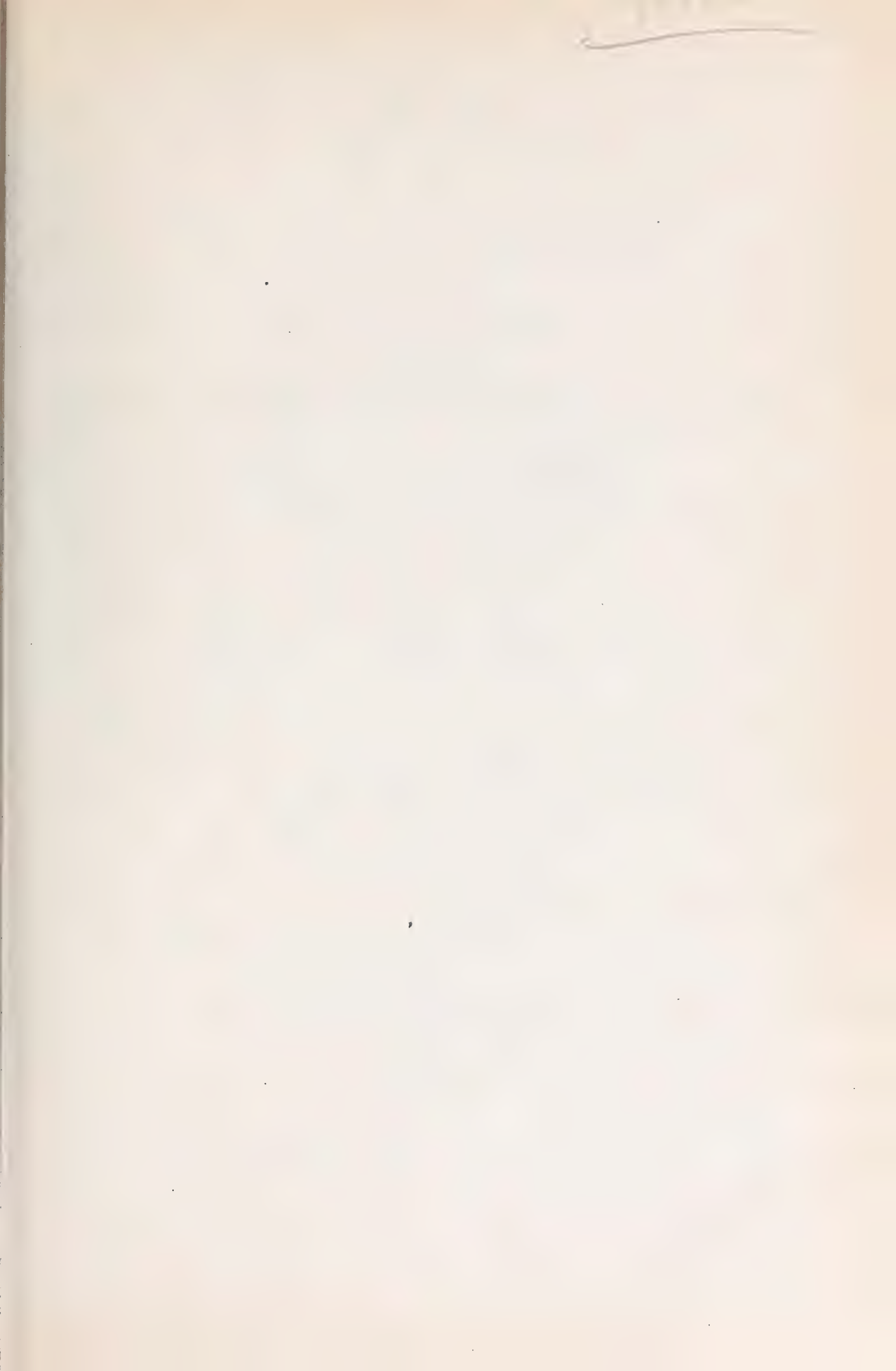
A phonograph or graphophone reproducer having a flat diaphragm with a hollow boss attached to its outer face and carrying the reproducer-point, substantially as specified.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ISAAC W. NORCROSS, JR. [L. S.]

Witnesses:

JAS. J. DALY,
FRANK WEBBER.



No. 676,463.

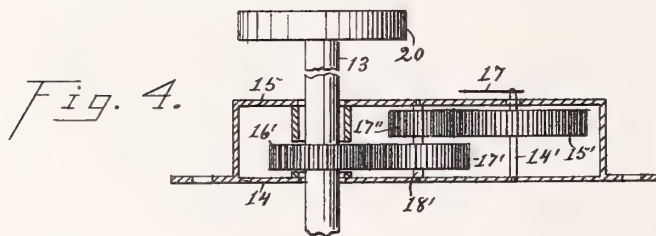
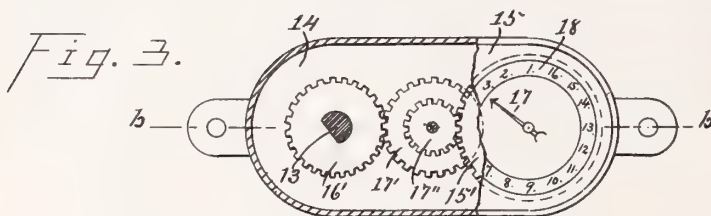
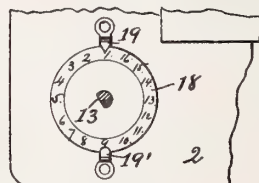
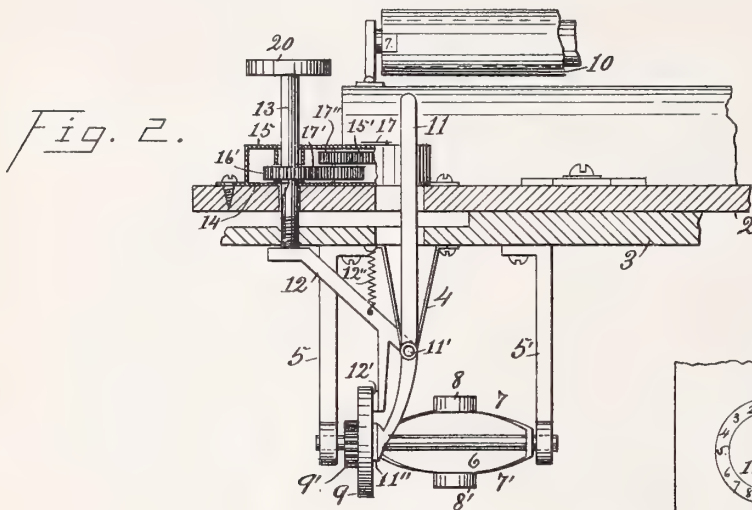
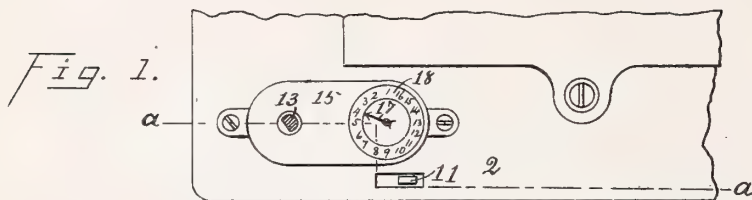
Patented June 18, 1901.

D. H. HILTON.

APPLIANCE FOR PREDETERMINING SPEED.

(Application filed Sept. 1, 1900.)

(No Model.)



Witnesses:
Albert C. Tamm.
Charles Reed,

Inventor:
David H. Hilton

UNITED STATES PATENT OFFICE.

DAVID H. HILTON, OF JERSEY CITY, NEW JERSEY.

APPLIANCE FOR PREDETERMINING SPEED.

SPECIFICATION forming part of Letters Patent No. 676,463, dated June 18, 1901.

Application filed September 1, 1900. Serial No. 28,753. (No model.)

To all whom it may concern:

Be it known that I, DAVID H. HILTON, a citizen of the United States, and a resident of Jersey City, in the county of Hudson and State of New Jersey, have invented certain new and useful Improvements in Appliances for Predetermining Speed, which improvements are fully set forth in the following specification and accompanying drawings, in which—
10 Figure 1 is a plan view of a speed-determining appliance embodying my said invention, the same being here illustrated substantially as it appears when attached to a sound-reproducing machine, as a phonograph, a
15 fragment of the latter being also shown. Fig. 2 is a vertical section of the parts shown in Fig. 1, the section being taken as along the line *aa* of Fig. 1. Fig. 3 is a plan view of the said appliance, a portion of the cover or top
20 inclosing wall thereof being broken away to disclose the interior mechanism and the scale being enlarged. Fig. 4 is a central longitudinal section of said appliance as on the line *bb* of Fig. 3, the scale corresponding with
25 Fig. 3. Fig. 5 is a detail plan view showing a somewhat-modified form of my improved appliance.

Similar reference-numerals denote like parts throughout the several views of the
30 drawings.

This invention relates to improvements in devices of that class which may be designated "appliances for predetermining speed," the same being designed for service in connection with a revoluble part or parts for the
35 purpose of predetermining the velocity or rate of speed at which such part or parts shall revolve under duly-applied power or energy.

The object of the invention is to provide an appliance of the character above indicated which shall be simple, inexpensive, and novel as regards construction, efficient in operation, and which shall admit of being readily
45 attached for service to a mechanical structure, as a phonograph or analogous sound-reproducing machine, embodying a revoluble part or parts.

The invention consists in the employment
50 of certain novelly-formed parts, in the novel disposition and arrangement of the various parts, in certain combinations of the latter

and novel manner of coöperation thereof, and in certain details of construction, all of which will be specifically referred to hereinafter and
55 set forth in the appended claims.

In the accompanying drawings the invention is represented as applied to a phonograph; but said invention may be availed of in connection with other mechanical contrivances embodying a revoluble part or parts the
60 speed of which it may be desirable to predetermine.

Having reference now to the accompanying drawings, 2 denotes a bed-plate having
65 attached to the under side thereof a horizontal frame 3, from which depend a hanger 4 and oppositely-arranged bearings 5 5', in the lower extremity of which bearings is mounted to rotate the governor-shaft 6, provided with elastic elements 7-7', the former
70 of which carries the governor-ball 8 and the latter the governor-ball 8'. There is also firmly mounted on the governor-shaft 6 a friction-disk 9 and a pinion 9', the latter adapted to mesh at all times with a member of a
75 suitable train of gear-wheels spring-actuated or otherwise impelled and whereby under certain conditions a rotary motion is imparted to the record or cylinder 10. The lever 11 is
80 mounted to work on the pivot 11' and is provided at its lower extremity with a shoe 11'' for engagement with the disk 9, and whereby a braking effect for the movable parts of the device as a whole may be had through
85 proper manipulation of the said lever 11.

12 is a spring-controlled arm mounted also to work on pivot 11' and having at its lower extremity a shoe 12', adapted under normal conditions to have frictional contact with the
90 disk 9 through the action of spring 12''.

The parts thus far described are of ordinary construction and are assembled in a manner well known in the art. The speed of the intermeshing parts is regulated in common practice through variable downward tilting of the arm 12 against the action of spring
95 12'', thus causing the shoe 12' to engage the disk 9 with variable degrees of friction. To accomplish this variable tilting of the arm 12, there is ordinarily provided an adjusting-stem, as 13; but it is further essential that means be provided whereby the range of adjustment of the stem 13 or degrees of such
100

adjustment of said stem may be determined and indicated to the end that the speed of, say, the governor-shaft 6 may be predetermined with respect to the starting of said shaft in motion.

As to phonographs and the like it is the common practice to place the record or prepared cylinder in position for service, start the machine in operation, and then if it is found that the record is revolving too rapidly or too slowly to produce the clearest enunciation effect the stem 13 is accordingly adjusted; but as the speed at which one record should move varies materially from the speed at which another record should move in order to obtain the best results the proper adjustment for the stem 13 is not readily determined.

The chief purpose of my invention is to overcome the objectionable feature above named, particularly in phonographs and analogous sound-reproducing machines, and to this end I provide an adjusting-stem, as 13, a part bearing degree-indicating characters and a record bearing a character corresponding with one of said degree-indicating characters, the said stem being capable of free longitudinal adjustment and capable when revolved of actuating said part.

As shown in the accompanying drawings, my improved appliance comprises a base 14, a top portion 15, by preference an inclosing wall 16, connecting said base and top portion and forming with said base and top portion a box-like body structure, and a train of gear-wheels arranged within said box-like structure, the shaft 14' on which the final member 15' of said train is mounted carrying at its upper end and outside the top portion 15 a pointer 17 for coöperation with the dial 18, here shown as directly applied to the outer surface of the top portion 15, as by painting or otherwise, though the same may be applied to a separate piece of material and the latter attached to the upper side of the top portion 15 in any well-known and approved manner. While the pointer 17 is here represented as movable and the dial as fixed or stationary, the arrangement of these parts may be reversed, if desired.

The initial member 16' of the train of gear-wheels referred to is here shown as loosely mounted on the stem 13, and as the latter is angular in cross-section and the opening in the member 16' corresponds therewith in contour the said member 16' acts with said stem when the latter is revolved, and at the same time said stem has longitudinal movement irrespective of said member 16'.

The member 16' meshes at all times with the gear-wheel 17', mounted on shaft 18', on which is also mounted the gear-wheel or pinion 17'', which meshes at all times with the final member 15'.

The stem 13 is provided with suitable threads adapted to engage the threads of a suitable opening formed in the frame 3 in

vertical alinement with the free end of the arm 12.

It will be understood that the gear-wheels 16', 17', 17'', and 15' or a similar train are essential only where the pitch of the threads of the stem 13 is such as to necessitate a plurality of revolutions of the stem 13 in order to move said stem throughout its range of longitudinal adjustment. In the event that the stem 13 be worm-threaded or so threaded that, say, a single revolution thereof shall be necessary in order to move said stem throughout its range of longitudinal adjustment the dial 18 may be mounted upon or directly applied to the stem 13, as indicated in Fig. 5, thus not only doing away with the train of gear-wheels mentioned, but also with the box-like structure therefor. Where the dial 18 is thus arranged for direct coöperation with the stem 13, it will lie along the upper side of the bed-plate 2 and may be there loosely held in any approved manner, as by means of the cleats 19 19', one of which may serve as a pointer.

The stem 13 is provided with a finger-piece 20.

10 denotes the record or prepared cylinder, of ordinary construction, and bearing a character corresponding with one of the characters on the dial 18.

In operation the user selects a record, mounts it in position for service, turns the stem 13 till the pointer 17 registers with the character on the dial 18 which corresponds with the character on said record, and then starts the machine in motion. The turning of the stem 13 will result in tilting the arm 12 downward, thus diminishing the friction of the shoe 12' on the disk 9, and the governor-shaft 6, record 10, and intermediate intermeshing parts will move at the required speed.

It will be understood that my improved appliance may be modified to some extent, particularly as to the details of the general construction, without material departure from the spirit and principle of my invention.

Having fully described my invention, what I claim, and desire to secure by Letters Patent, is—

1. A device of the class herein described comprising a casing, a stem extending through said casing and therein movable longitudinally and rotarily, and means for indicating variable degrees of movement of said stem, the device as a whole being constructed and arranged for removable attachment to a sound-reproducing machine, substantially as herein specified.

2. A device of the class herein described comprising a casing having graduations thereon, a stem extending through said casing and therein movable longitudinally and rotarily, a movable pointer, and elements between said pointer and said stem and whereby said pointer may be moved upon movement being

imparted to said stem, the device as a whole being constructed and arranged for removable attachment to a sound-reproducing machine, substantially as herein specified.

5 3. In a sound-reproducing machine, in combination, a rotatable governor-shaft, brake mechanism for controlling the movement of said shaft, a casing constructed and arranged for removable attachment to said machine,
10 a stem extending through said casing, therein movable longitudinally and rotarily, and whereby said brake mechanism may be actuated, and means for indicating variable degrees of movement of said stem, substantially
15 as herein described.

4. In a sound-reproducing machine, in combination, a rotatable governor-shaft, brake mechanism for controlling the movement of said shaft and comprising a spring-controlled,
20 movable arm, a casing constructed and arranged for removable attachment to said machine, a stem extending through said casing, therein movable longitudinally and rotarily, and engaging at its lower end the free-end of
25 said movable arm, and means for indicating variable degrees of movement of said stem, substantially as herein described.

5. In a sound-reproducing machine, in com-

bination, a casing constructed and arranged for removable attachment to said machine, a 30 stem extending through said casing and therein movable longitudinally and rotarily, means for indicating variable degrees of movement of said stem, and a sound-record bearing a character indicative of a degree of movement 35 of said stem, substantially as herein described.

6. In a sound-reproducing machine, in combination, a casing constructed and arranged for removable attachment to said machine, a 40 stem extending through said casing and therein movable longitudinally and rotarily, the said casing bearing characters indicative of variable degrees of movement of said stem, a movable pointer, elements between said 45 pointer and said stem and whereby said pointer may be moved upon movement being imparted to said stem, and a sound-record bearing a character corresponding with one of the characters on said casing, substantially 50 as herein described and for the purpose set forth.

DAVID H. HILTON.

Witnesses:

W. H. RUBY,

ALBERT C. TANNER.

1897

G. H. STEVENS.
PROCESS OF DUPLICATING PHONOGRAMS.
 (Application filed Oct. 11, 1900.)

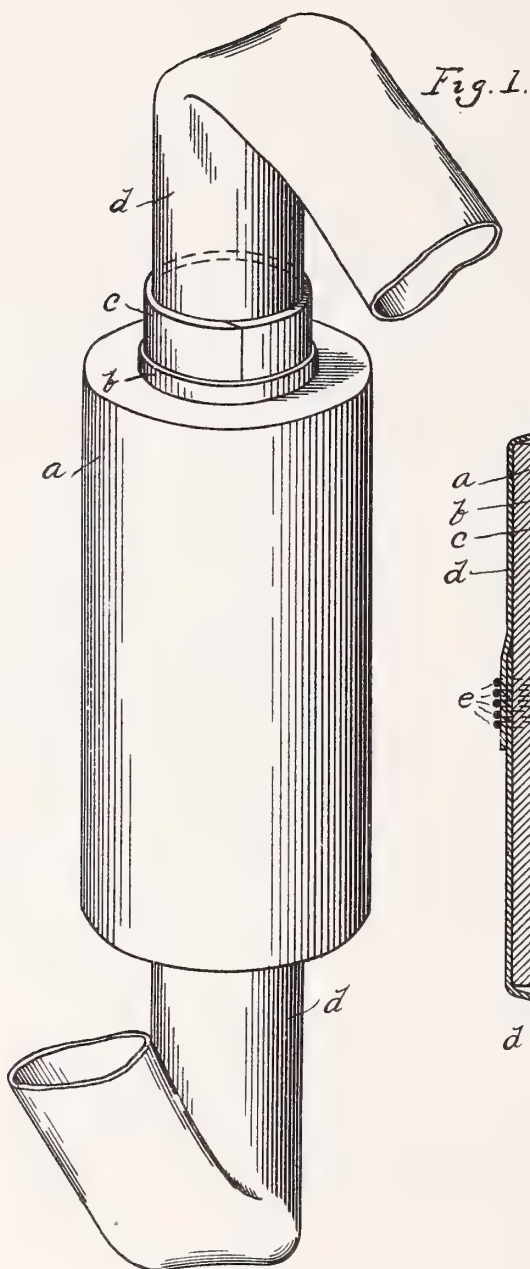


Fig. 1.

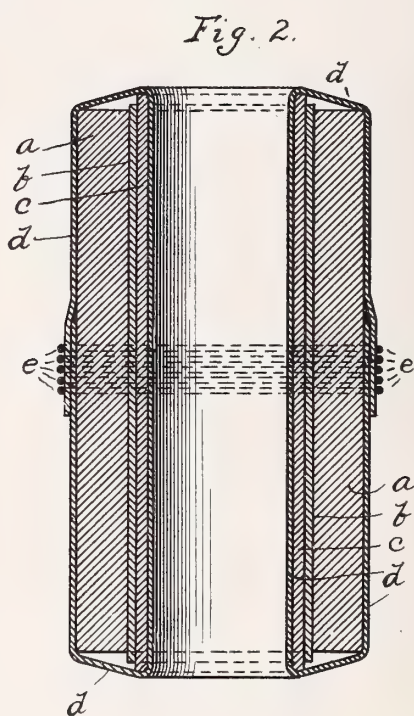


Fig. 2.

WITNESSES
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May E. Kott.

By

INVENTOR
George H. Stevens
Parker & Burton.
 Attorneys.

UNITED STATES PATENT OFFICE.

GEORGE H. STEVENS, OF TOLEDO, OHIO.

PROCESS OF DUPLICATING PHONOGRAMS.

SPECIFICATION forming part of Reissued Letters Patent No. 11,917, dated July 2, 1901.

Original No. 650,431, dated May 29, 1900. Application for reissue filed October 11, 1900. Serial No. 32,738.

To all whom it may concern:

Be it known that I, GEORGE H. STEVENS, a citizen of the United States, residing at Toledo, Lucas county, Ohio, have invented a certain new and useful Process of Duplicating Phonograms, of which the following is a specification.

In the reproduction of cylindrical sound-records for phonographs and analogous machines the results have proved unsatisfactory owing to the soft and frail nature of the material employed. It is found that these records are easily scratched, defaced, marred, or broken, that they wear out quickly, and are not convenient for shipping unless extraordinary care is taken in packing them. To obviate these objections, I duplicate the record upon material that is so hard, tough, and flexible that it will take an impression only under hydrostatic or some other very high pressure. It is also found that the duplication of these cylinders is slow, laborious, and expensive and that their efficiency is diminished with each successive reproduction from the original. These difficulties and objections are due to the fact that heretofore no successful method has been devised for forming upon a seamless cylinder of hard tough resisting material a perfect cast or impression from a seamless mold or matrix containing the sound-record, because the withdrawal of such cast or impression from a seamless matrix would break down and destroy the delicate wave-lines of the sound-record either in the matrix or the reproduction, or both.

My invention relates to and one object is by the method or process hereinafter described to provide a seamless cylindrical duplicate of a cylindrical phonogram or sound-record, which record may be composed of hard tough resisting material, to prepare the same from a seamless matrix, and to make these reproductions in such manner that the matrix may be used over and over indefinitely without apparent deterioration.

The further object of my invention is to provide phonograms of the character described which shall be effective, cheap, light, durable, capable of being roughly handled without breaking or spoiling the same, and capable of being packed or nested in very small compass either by constructing the

same in slightly-conical form or in cylinders of various diameters.

To this end the first step in my process consists in electrically depositing upon and around the usual cylindrical wax record an electrotype matrix or mold, first depositing a thin shell of nickel upon the wax and then depositing upon this a heavy shell of copper, the purpose of the nickel being to give to the interior face of the matrix a smooth surface that does not easily tarnish, that is harder than copper, and that will produce a higher polish upon the surface of the phonogram record that is afterward pressed therein. Now from this matrix or mold the substance of which the original record is formed is entirely removed by melting or otherwise. The second step in my process is to introduce into the hollow of the matrix a thin closely-fitting cylinder of any hard tough resisting material having sufficient flexibility to allow it to bend without breaking. In practice I prefer celluloid. Sheet-celluloid may be readily obtained in the markets as thin as one one-hundredth of an inch and should be formed into thin flexible cylinders without joints or seams and of the proper diameter. If the finished and perfect cylinder-blanks cannot be readily obtained, they may be formed out of flat celluloid sheets cut of proper size to make a blank cylinder having a lapping joint of, say, one-eighth of an inch, more or less. The lapping surfaces when moistened with alcohol or ether will soften sufficiently to readily and firmly unite with each other when dry, and these edges when dried under pressure are smoothly and perfectly welded. Any unevenness or exposed edge may be readily dressed off in a lathe to a smooth and even surface, leaving the exterior surface of the cylinder without break or seam. Into this thin flexible cylinder is inserted a closely-fitting thin spring-brass cylinder longitudinally cut or split along one of its sides. When the edges of this piece are brought together, the outer surface is smooth and has the contour of the cylinder. When one of the edges is pressed inwardly out of line, the piece may be collapsed somewhat, so that it may readily be withdrawn from the cylinder. The celluloid blank, with its metal backing, is now slipped into the matrix or mold, which exactly fits

the blank when in place. I provide the matrix and its contents with a flexible water-tight jacket or covering. This may be conveniently accomplished by drawing through the hollow of the inner brass cylinder a piece of soft-rubber tubing considerably longer than the matrix and then turning the ends of the tube backward upon the outside of the matrix, so that the ends of the soft-rubber tubes are turned inside out and overlap each other. The rubberenvelop thus formed may be secured against leak by winding with wire the overlapping portions of the tube or by clamping the same with a suitable band. I next subject the matrix and its contents to hydrostatic pressure. To accomplish this, I prefer to use a hydraulic "gun," which consists of a chambered piece or pieces of suitable metal constructed of necessary strength and having its chamber connected with a hydraulic pump of the required power. The hydraulic gun is also provided with a steam-jacket properly connected for heating the gun and its contents. In the chamber of this gun liquid-pressure is always uniform in all directions, and great compression may be obtained upon anything that may be contained therein when the interior of the object to be compressed is properly protected from access of the liquid employed in the gun. The matrix (or several of them) and its contents, inclosed in the water-tight flexible envelop, are placed inside the hydraulic gun, which is suitably closed and filled with water or other liquid. The contents of the gun are now subjected to hydrostatic pressure, which acts equally in all directions upon the soft-rubber covering. Its effect, therefore, is to force the rubber against the spring-brass cylinder and the spring-brass cylinder against the celluloid blank, which in turn is compelled to expand slightly and is thus forced against the interior face of the matrix. There will now be embossed or molded or stamped on the surface of the celluloid the reverse impression of the matrix itself, thus producing an exact duplicate of the original wax record. Although the spring-brass backing may be omitted, better results are obtained from its use. The office of the spring-brass cylinder is to firmly apply the liquid-pressure to the celluloid blank with a less yielding face than would be the case if the pressure were applied directly to the rubber and celluloid. It will be seen that by reason of the liquid-pressure in the gun acting equally and uniformly in all directions, and as the external and internal pressure on the matrix are the same, the matrix is preserved from crushing, breaking, or distortion. To further assist the process of pressing, as soon as a light pressure of, say, two thousand pounds to the square inch has been applied steam is allowed to fill the steam-jacket until the gun and its contents are well heated. This causes the blank of celluloid or the like to become in consequence more plastic and yielding than when

cool, and it will under this condition mold easier when the heavier pressure is later applied. As soon as the blank has become hot further pressure is applied to the gun by the hydraulic pump. The steam when properly manipulated through the jacket will then by expansion increase the pressure within the gun until the registering-dial will indicate, say, from fifteen thousand to fifty thousand pounds pressure per square inch. The former figure is generally sufficient for a fair effect; but the nearer the latter figure is approached the more satisfactory are the results. The time necessary for the entire operation of pressing occupies usually from one to two hours. When a proper pressure has been exerted for a sufficient time, the steam is turned off from the steam-jacket, which allows the contents of the gun to cool and contract somewhat, thus lowering the pressure. Now the pressure should be kept up by the pump until the gun and its contents have become cooled, for in embossing and pressing compositions under heat best results are obtained by allowing the material to become cool while yet under full pressure. Instead of employing a hydraulic gun in the pressing process the matrix may be made very strong and provided with means for capping or sealing its ends hermetically, the whole being constructed to withstand a sufficient interior pressure without a corresponding exterior one. This matrix should be provided with a steam-jacket, and inside of the matrix should be a rubber bag attached to the hydraulic connection, so that when the liquid-pressure is applied moisture will be excluded from the interior of the matrix, the cylinder, and the cylindrical spring-brass backing. This device is, however, the obvious mechanical equivalent of the gun or any other means of obtaining interior hydrostatic pressure upon the cylinder. As only comparatively low pressures can be employed in the modification here suggested, the use of the gun above described is much to be preferred. When sufficiently cool, the chamber of the gun is opened and the matrix and its contents are taken out. The wire or band is now removed from the outside of the rubber, the rubber being stripped off readily, as its adhesion is but slight, and the spring-brass cylinder is collapsed and removed, as above indicated. The inner face of the matrix will be found to have a lining of celluloid or the like firmly and uniformly embedded upon its face, which lining is quite flexible. Now if a stiff blunt small steel wire or other suitable instrument is carefully inserted between the celluloid cylinder and the matrix itself the side of the flexible cylinder can be sprung inwardly, thus reducing the exterior circumference of the cylinder, which permits the cylinder to be readily detached and withdrawn from its matrix or mold without injury to either the mold or the phonogram. It will be seen that from a seamless matrix

or mold has been constructed and embossed or stamped a seamless record of practically indestructible material, having on its surface an exact reverse impression of the matrix and

5 having such a sharp distinct impression as will cause the usual needle and diaphragm of a talking-machine of the type in question to respond in exactly the same manner as do the original common wax records when new.
10 The thin flexible phonogram, which may, if wished, be formed somewhat tapering, is now slipped onto a suitable hollow mandrel or holder properly constructed for the purpose and, if desired, may be securely fastened there
15 by some adhesive substance, though preferably I employ a rigid hollow mandrel with a slightly-tapering exterior surface upon which the record may be crowded tightly, said mandrel having an interior face, also slightly
20 tapering, but with a suitable diameter and taper to fit snugly over the usual mandrels with which the various types of talking-machines are usually supplied. The thin flexible record is now ready for use.

25 In the accompanying drawings, made part hereof, Figure 1 is an elevation of a matrix or mold, a blank and its backing of spring-brass, and a rubber tube in the course of being assembled to receive hydrostatic pressure; and Fig. 2 is a central sectional elevation of the same assembled ready for hydrostatic pressure.

In the drawings, *a* is the matrix or mold; *b*, the blank cylinder; *c*, the inner spring-cylinder or backing, and *d* the elastic tube to form the water-tight jacket.

35 In Fig. 2, *e* represents the wire or band with which the backwardly-turned overlapping ends of the tube *d* are bound and compressed to make a water-tight joint.

40 Having described my invention, what I claim, and desire to secure by Letters Patent, is—

1. The improvement in the process of forming a duplicate cylindrical phonogram of plastic material from an electrotype-matrix, which consists in introducing into the plastic cylinder an expansible backing of solid material, and then expanding said last-mentioned cylinder.
50

2. The improvement in the process of forming a duplicate cylindrical phonogram of plastic material from an electrotype-matrix, which consists in introducing into the plastic cylinder an expansible backing of solid material, then excluding moisture from the matrix and its contents, and then subjecting the backing of solid material to internal hydrostatic pressure.
55

3. The method or process of duplicating cylindrical phonograms which consists in forming a seamless electrotype matrix or mold from the phonogram to be duplicated, then introducing into said matrix a flexible blank
60 cylinder of hard, tough material having a solid backing separable therefrom, then ex-

cluding moisture from the face of the matrix, the blank and its backing, and then applying hydrostatic pressure to the interior of the blank and its backing, substantially as described.
70

4. The method or process of duplicating cylindrical phonograms which consists in forming a seamless electrotype matrix or mold from the phonogram to be duplicated, then
75 introducing into said matrix a hollow, blank cylinder having a separable solid backing, and then applying hydrostatic pressure to the interior of said backing, substantially as described.
80

5. The method or process of duplicating cylindrical phonograms which consists in forming an electrotype seamless matrix from the phonogram to be duplicated, then introducing
85 into said matrix a blank of hard, tough, flexible substance having a separable solid backing, then applying hydrostatic pressure to the interior of the blank and its backing, and then separating the matrix, the phonogram thus produced, and its backing, substantially
90 as described.

6. The method or process of duplicating cylindrical phonograms which consists, first, in forming an electrotype, seamless matrix or mold from the phonogram to be duplicated;
95 second, introducing into said matrix a thin flexible blank cylinder having a suitable backing of solid material; third, excluding moisture from the face of the matrix and the blank; fourth, applying hydrostatic pressure
100 to the interior of the blank and its backing, and, fifth, separating the matrix, the phonogram thus formed and its backing, substantially as described.

7. The method or process of duplicating a
105 cylindrical phonogram which consists in forming a hollow cylindrical matrix or mold having the reverse record upon its interior surface, introducing into said matrix a hollow
110 blank cylinder of a substance that may be molded by hydraulic pressure, excluding the access of water to the contiguous surfaces of said matrix and said blank, while permitting the access of the water to the interior of the inner cylinder, placing said matrix and blank
115 into the chamber of a hydraulic gun, and increasing the hydraulic pressure in said chamber, and finally separating the newly-impressed record-cylinder from the matrix, substantially as described.
120

8. The method or process of duplicating a cylindrical phonogram which consists in forming a hollow cylindrical matrix or mold having the reverse record upon its interior surface, introducing into said matrix a hollow,
125 blank cylinder of a material that may be molded by hydraulic pressure inclosing the walls of said matrix and blank in a flexible annular envelop impervious to water, concentric with said cylinders, placing said matrix
130 and blank so inclosed into the chamber of a hydraulic gun, and increasing the pressure

in said chamber, and finally separating the newly-impressed record-cylinder from the matrix, substantially as described.

9. The method or process of duplicating a
5 cylindrical phonogram which consists in forming a cylindrical matrix or mold having the reverse record upon its interior surface, introducing into said matrix a blank cylinder
10 of a material that may be molded by hydraulic pressure, passing a thin, flexible tube impervious to the fluid used, through said cylinders and doubling it back over the ends thereof until the ends of said tube overlap, placing said matrix and blank so inclosed into the
15 chamber of a hydraulic gun, and increasing the pressure in said chamber, substantially as described.

10. The method or process of duplicating a cylindrical phonogram which consists in form-

ing a cylindrical matrix or mold having the
20 reverse record upon its interior surface, introducing into said matrix a blank cylinder of a material that may be molded by hydraulic pressure, passing a thin rubber tube through
25 said cylinder and doubling it back over the ends thereof until the ends of said rubber tube overlap, placing said matrix and blank so inclosed into the chamber of a hydraulic gun and increasing the pressure in said chamber, substantially as described.

Signed at Detroit, county of Wayne, and
30 State of Michigan, this 21st day of September, 1900.

GEORGE H. STEVENS.

Witnesses:

NETTIE V. BELLES,

ELLIOTT J. STODDARD.

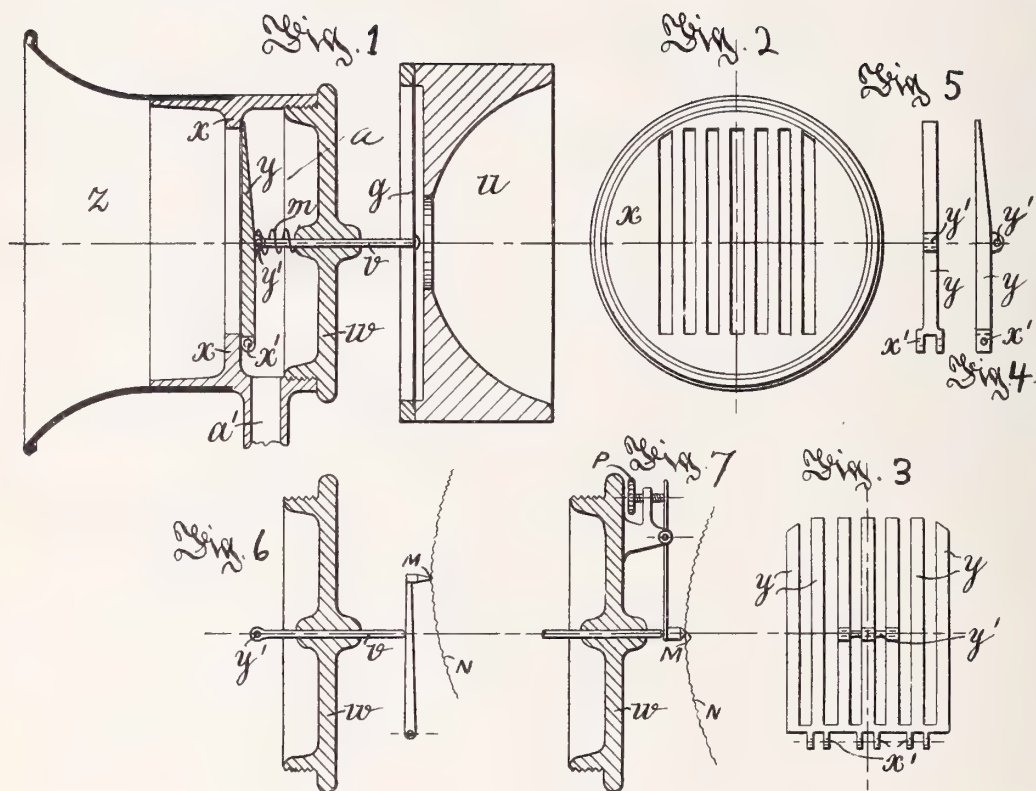
No. 677,476.

Patented July 2, 1901.

H. L. SHORT.
SOUND INCREASING DEVICE.

(Application filed Apr. 29, 1899.)

(No Model.)



Witnesses:
Ella L. Gile
O. Munn

Inventor:
H. L. Short
By Richard R. Short
ATTORNEYS

UNITED STATES PATENT OFFICE.

HORACE LENOARD SHORT, OF NEW MALDEN, ENGLAND.

SOUND-INCREASING DEVICE.

SPECIFICATION forming part of Letters Patent No. 677,476, dated July 2, 1901.

Application filed April 29, 1899. Serial No. 715,075. (No model.)

To all whom it may concern:

Be it known that I, HORACE LENOARD SHORT, a subject of the Queen of Great Britain, residing at New Malden, in the county of Surrey, England, have invented certain new and useful Improvements in Sound-Increasing Devices; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to articulate messages or other sounds produced by the vibrations of diaphragms in telephones, telephonic instruments, or the like or produced by mechanical means by phonographic instruments; and it has for its object improvements in the method of reproducing and increasing the volume and audibility of such sounds, so that they can be much more readily heard than is ordinarily the case and can be made audible at long distances. My improved means of so increasing the sounds obtained by instruments of the kind described or of the like kinds relate more particularly to improvements in the known devices more or less analogous to the "relays" ordinarily used in the transmission of electric-telegraph messages to long distances. In such devices the vibrating diaphragm of a telephone receiving instrument or the "style" or point which presses upon the cylinder (or disk) of a phonograph is made to cause or influence corresponding vibrations or interruptions in a column or body of air, these interruptions being reproduced upon a largely-magnified scale from and by the governing vibrations of the telephone-diaphragm or of the phonographic point, the sounds produced being directed in any desired direction by means of a trumpet-shaped or other apparatus, through which they are delivered and dispersed.

In the drawings, Figure 1 is a central sectional view of my invention. Fig. 2 is a front view of part of Fig. 1. Fig. 3 is a detail view relating to Fig. 1. Figs. 4 and 5 represent further detail views. Fig. 6 is a detail sectional view of a modified portion of Fig. 1. Fig. 7 is a similar view of a modification of Fig. 5.

In Fig. 1 the voice is used to speak into a mouthpiece *u* and set in corresponding vi-

bration the telephonic diaphragm *g*. The diaphragm *g* is shown connected with a spindle *v*, which passes through the cap *w*, fitted upon the end of the chamber *a*, of suitable diameter, into which air under sufficient pressure is forced through the pipe *a'*. Across the chamber *a* is a rigid diaphragm or partition *x*, having a series of parallel slits through it, forming a grating, as shown in front view in Fig. 2. To the partition *x* is hinged at *x'* a plate consisting of a series of light tongues or strips *y* of such size as just to close the holes forming the grating in *x*. This plate of tongues is connected at *y'* to the spindle *v*, operated by the diaphragm *g* of the telephone when the latter is spoken to, and the vibrations of the diaphragm *g* are therefore transmitted to the tongues *y*, which open and more or less close the passages through the grating *x* at a speed and in a manner exactly corresponding with the movements or vibrations of the diaphragm *g* and cause corresponding undulations in the column of air which is forced in at *a'* and is discharged through the trumpet-mouthed pipe *z*, the words or other sounds uttered into the telephone at *u* being reproduced, very greatly magnified and strengthened, and capable of being heard at a great distance by the more or less complete closing at very rapid intervals of the apertures or grating through which the air is forced. This form of apparatus is especially adapted to be used where the loud sounds to be produced are obtained by the undulations of the column of air forced through the valve, as shown. A spring *m* assists in bringing back the tongues.

In Fig. 6 the same apparatus is shown partly broken off, but operated by movements of the style or point *M* of a phonograph upon a properly-indented cylinder *N* or disk.

Fig. 7 shows a regulating-screw *P*, by which the pressure on the spindle between the valve *y* and the phonograph-cylinder *N* can be exactly adjusted and regulated.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. An apparatus for increasing the sound for telephones, phonographs and a similar instrument having a part adapted to vibrate in accordance with sound-waves comprising a valve for controlling the passage of a fluid-

current, said valve consisting of a plate provided with slits and movable tongues for controlling said slits and a connection leading from said valve to the said vibrating part,
5 substantially as described.

2. In combination, the valve-box having air inlet and discharge portions, a grating of parallel bars in said chamber forming a valve-seat, a hinged grating of corresponding bars

forming a valve, and means for vibrating 10 said valve, substantially as described.

In testimony whereof I have hereunto affixed my signature in presence of two witnesses.

HORACE LENOARD SHORT.

Witnesses:

ARTHUR E. EDWARDS,

H. E. SYKES.



W. B. OUTTEN.
SOUND BOX.

(Application filed Feb. 19, 1901.)

(No Model.)

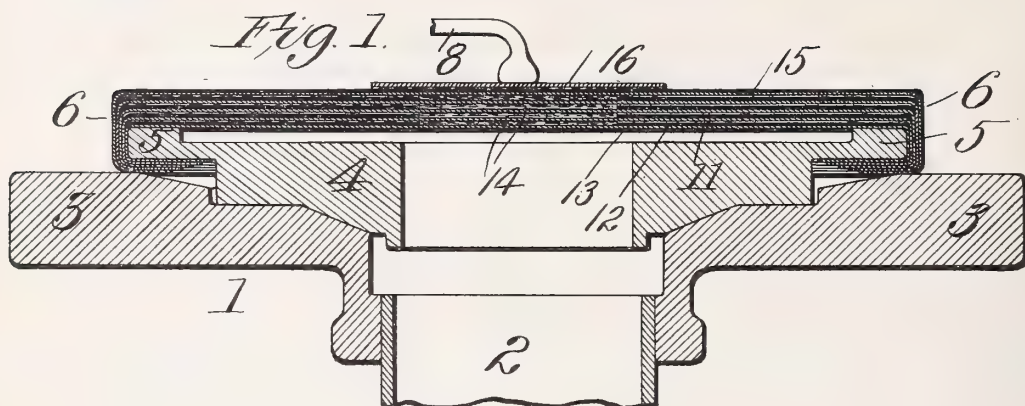
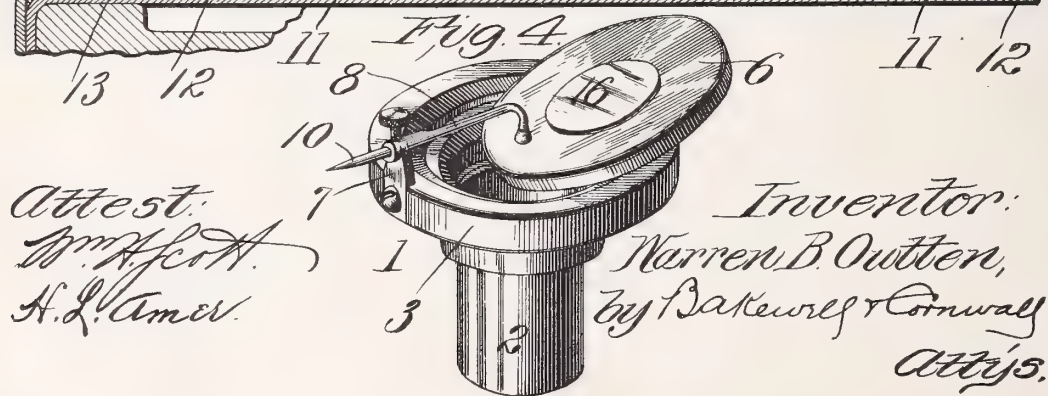
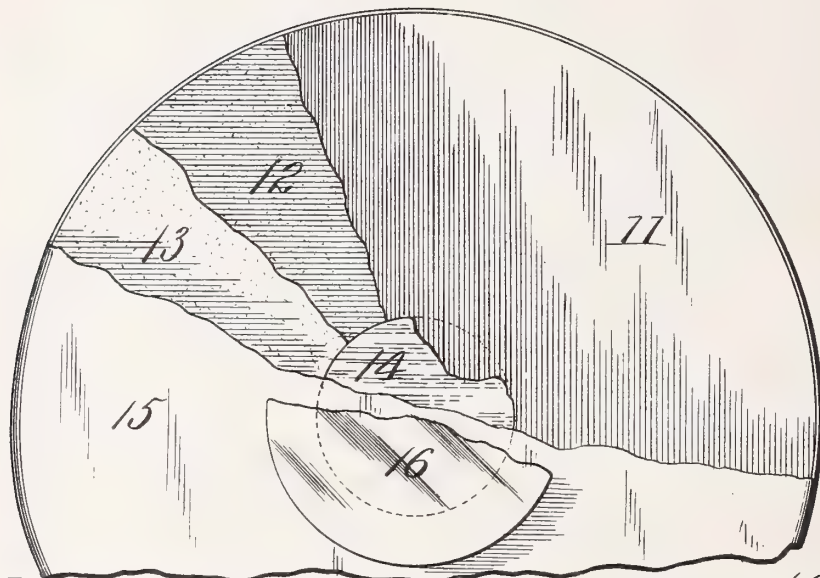


Fig. 2.



Attest:
Wm. H. Scott
H. L. Amer.

Inventor:
Warren B. Outten,
by Baker & Cornwall
Attys.

UNITED STATES PATENT OFFICE.

WARREN B. OUTTEN, OF ST. LOUIS, MISSOURI.

SOUND-BOX.

SPECIFICATION forming part of Letters Patent No. 677,690, dated July 2, 1901.

Application filed February 19, 1901. Serial No. 48,005. (No model.)

To all whom it may concern:

Be it known that I, WARREN B. OUTTEN, a citizen of the United States, residing at the city of St. Louis, in the State of Missouri, have
5 invented a certain new and useful Improvement in Sound-Boxes, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is an enlarged vertical sectional view through my improved sound-box. Fig. 2 is a partial plan view. Fig. 3 is an enlarged detail view in section, illustrating the manner of securing the diaphragms together; and Fig. 4 is a view illustrating the manner of removing the diaphragm-ring.

10 This invention relates to a new and useful improvement in sound-boxes designed particularly, though not exclusively, for use in connection with gramophones or other sound recording and reproducing machines.

25 The objects of the present invention are to produce a sound-box having a clear and distinct tone of great volume and also to arrange the transmitting-diaphragm on a removable ring, whereby different diaphragms having different properties or characteristics
30 may be employed in connection with the same sound-box to bring out more clearly and distinctly certain sounds to be transmitted, which sounds might otherwise be lost.

35 With these objects in view the invention consists in the construction, arrangement, and combination of the several parts, all as will hereinafter be described, and afterward pointed out in the claims.

40 In the drawings, 1 indicates the sound-box, consisting of a tube 2 and a flanged head-plate 3.

45 4 indicates the diaphragm-ring, having a projecting flange 5 for supporting the diaphragm, said ring having its rear face beveled or otherwise shaped, so as to seat itself properly in the recessed face of the head-plate 3.

50 6 indicates the diaphragm as an entirety, whose edges are preferably secured in position under the ring 4 in some suitable man-

ner,—such, for instance, as by the use of an adhesive substance or a string.

7 indicates the needle-post, mounted on the edge of the head-plate 3, and 8 the arm, which extends over and bears upon the center of the diaphragm, thereby holding the detachable diaphragm-ring in its seat in the head-plate.

10 indicates the needle.

The ring 4 and its carried diaphragm are removably mounted in the recess in the head-plate, and when in position the needle-arm is placed under tension by being sprung outwardly slightly, and this contact has been found sufficient to accurately transmit the sound-waves in the form of vibrations either from the sound-box to the needle, as in recording, or from the record, through the needle and its arm, to the diaphragm, as in reproducing. Of course the diaphragm is also under tension when the needle-arm bears thereagainst, and this tension being opposed to the spring of the needle-arm establishes a normal position of equilibrium, rendering both the arm and diaphragm exceedingly sensitive to vibration both in recordation and reproduction of sound-waves. It is obvious that this tension must be sufficient to keep the parts in constant contact and at the same time permit them to vibrate and accurately transmit all the sound-waves. I thus dispense with the necessity of attaching the needle-arm to the diaphragm and am enabled to remove and insert the diaphragms at will, depending upon the qualifications of the various diaphragms employed and the quality of sound to be recorded or reproduced.

I have herein referred to the diaphragm in the singular, but will state that said diaphragm is built up of a number of layers attached together at their edges, while a central portion of each layer is unattached.

Depending upon the kind of sound to be transmitted, the layers of gold-beaters' skin, silk, or other suitable material (preferably flexible) are saturated with a liquid chlorid or other solution best adapted to develop the particular sound intended to be transmitted, and while in a wet condition I select the first layer and stretch it tightly over the ring 4, securing its edges firmly in position. Refer-

ring to Fig. 3, 11 indicates the first layer. I now place a disk, preferably circular, (not shown,) in the center of the layer and coat the marginal edge of the layer with a self-hardening substance 12—as, for instance, oil of resin. When this dries, I apply a coating of adhesive substance 13, remove the centrally-located disk, and in the space formerly occupied by the disk introduce a non-congealable and non-volatile liquid 14, said liquid being preferably albolin. The next layer 15 in a wet or moist condition is now stretched in position tightly and its edges secured in place, the adhesive substance forming a bond between the two layers, while there is a central chamber between said layers filled with liquid. This second layer is now treated in the manner above described—that is, the self-hardening substance is applied around the edge, the adhesive substance spread thereover; the non-congealable liquid placed in the central space, and the third layer stretched in position, this procedure being followed as each layer is applied, with the exception of the last or uppermost. The number of layers thus arranged on the ring may vary according to the conditions to be met. I have found that five or six are best suited for general use. The top layer is coated with some self-hardening substance—such as oil of resin, shellac, &c.—and a metallic disk 16 attached thereto, said disk being preferably circular and of greater diameter than the spaces containing the liquid.

A diaphragm constructed as above has the advantage of being a composite structure capable of being enlarged or diminished with regard to the number of layers used, in addition to which layers of different material may be employed in the same diaphragm and each layer treated to different baths for the purpose of developing certain tones. The marginal attachment of the layers when the liquid vehicle of the bond volatilizes serves to draw the central unattached portion more taut, the strain being uniform and in an outward direction from all points. The liquid filling between these taut unattached areas serves as a positive and direct transmitting medium. It is extremely sensitive to all vibrations and readily lends itself to the movement of the several layers of the diaphragm, so that when sound-waves are transmitted therethrough the original purity of tone is preserved to a greater extent than is usual with the types of devices of this character in common use. Furthermore, the vibrations are concentrated in a restricted area, so that

they are intensified to a degree, which is very desirable.

I am aware that minor changes in the arrangement, construction, and combination of the several parts of my device can be made and substituted for those herein shown and described without in the least departing from the nature and principle of my invention.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. The combination with a sound-box, of an overhanging needle-bar, a support therefor, a removable diaphragm-ring, a diaphragm stretched over said ring, and a metallic disk on the diaphragm for engaging the overhanging end of the needle-bar; substantially as described.

2. A composite diaphragm composed of a number of layers, attached together throughout, except at about the centers thereof; substantially as described.

3. A diaphragm-ring in combination with a diaphragm composed of a number of layers stretched over the ring and secured together except at about the centers thereof; substantially as described.

4. A diaphragm composed of a number of layers secured together except at about the centers thereof, and liquid between the unattached portions; substantially as described.

5. A diaphragm composed of a number of layers having a self-hardening bond between their margins, said bond spacing the layers and forming inclosed chambers; substantially as described.

6. A diaphragm composed of a number of layers having a self-hardening bond between their margins, said bond spacing the layers and forming inclosed chambers, and liquid in said chambers; substantially as described.

7. In combination with a ring, of a diaphragm composed of a number of layers stretched thereover, a bond between the margins of the layers for spacing the same and forming inclosed chambers, liquid in said chambers, and a metallic disk on the outermost layer whose edges overlap the inner perimeter of the bond between the layers; substantially as described.

In testimony whereof I hereunto affix my signature, in the presence of two witnesses, this 16th day of February, 1901.

WARREN B. OUTTEN.

Witnesses:

WM. H. SCOTT,
GEORGE BAKEWELL.



No. 678,174.

Patented July 9, 1901.

J. R. HARE.
PHONOGRAPH.

(Application filed Mar. 26, 1901.)

(No Model.)

Fig. 1.

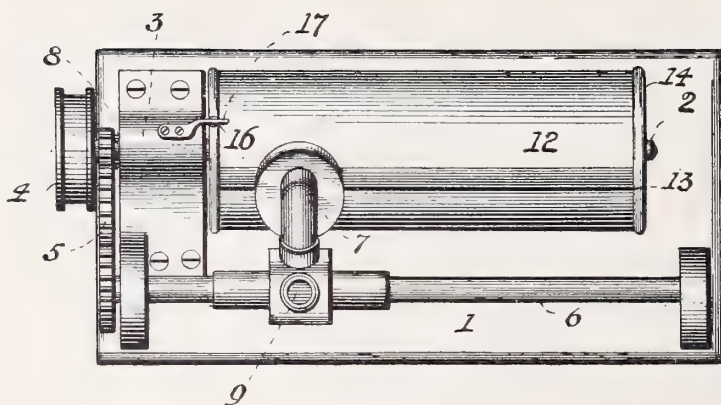


Fig. 2.

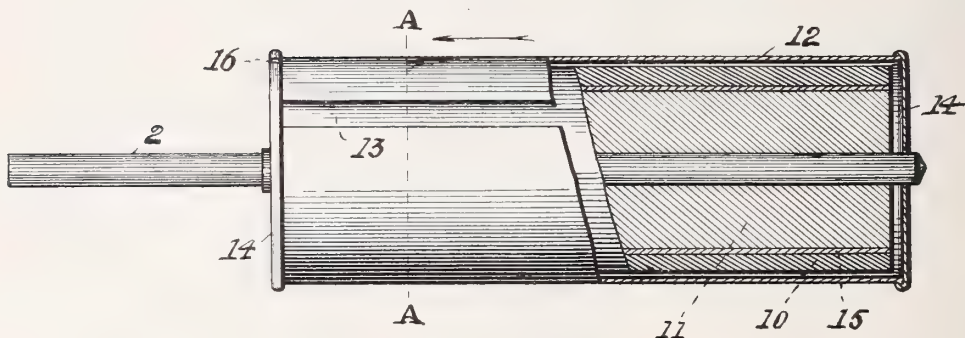
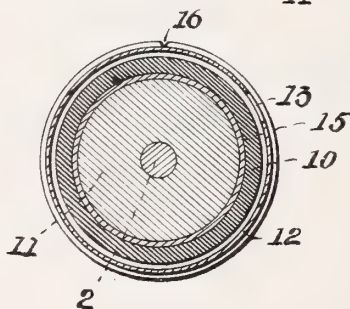


Fig. 3.



Witnesses

C. H. Walker
Edw. J. Croft

Inventor

John R. Hare
by W. H. T. Howard
Attorneys

UNITED STATES PATENT OFFICE.

JOHN R. HARE, OF BALTIMORE, MARYLAND.

PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 678,174, dated July 9, 1901.

Application filed March 26, 1901. Serial No. 52,906. (No model.)

To all whom it may concern:

Be it known that I, JOHN R. HARE, of the city of Baltimore and State of Maryland, have invented certain Improvements in Phonographs, of which the following is a specification.

The object of the present invention is to protect phonograph-records against injury by handling and in transporting and storing the same; and the said invention consists in enclosing a record in a casing, in which it may rotate freely, the said casing having a slot through which the style passes to contact with the record.

In the further description of the said invention which follows, reference is made to the accompanying drawings, forming a part hereof, and in which—

Figure 1 is a top view of certain parts of a phonograph embodying the present invention. Fig. 2 is an enlarged partly-sectional side view of the record, its casing, core, and shaft. Fig. 3 is a cross-section taken on the dotted line A A of Fig. 2 and looking in the direction indicated by the arrow.

Referring now to the drawings, 1 is the bed of the phonograph, and 2 the shaft of the record, one end of which is adapted to enter and be secured so as to turn with the sleeve 8, which rotates in the bearing 3.

4 is a driving-pulley on the sleeve 8, and 5 a train of gearing which transmits rotary movement from the sleeve 8, carrying the shaft 2, to the feed-screw, (not shown,) which screw, as in ordinary cases, is inclosed within a sleeve 6, along which the sound-reproducer traverses and which is slotted at its under side in order that a segmental nut (not shown) may be brought into contact with the said screw. The casing containing the diaphragm is denoted by 7, and the nozzle to which the horn is attached by 9.

Referring now particularly to Figs. 2 and 3, it will be seen that the record, which is denoted by 10, is secured to the core 11, which

is preferably of wood and which in turn is fastened to the shaft 2, and that the whole is placed within a casing 12, having the style-slot 13, the heads 14 of which serve as bearings for the said shaft. In order to prevent the record being burst by unequal expansion of the wood and composition from which the record is made, I interpose between the core and the record an annulus 15 of some slightly-compressible substance, such as paper.

It is necessary that the casing 12 should be held stationary when the instrument is in operation, and to this end I preferably notch the casing at 16, and provide some fixed part of the apparatus with a lock 17, adapted to enter the said notch, as shown in Fig. 1.

From the foregoing description it will be understood that each record is contained within a casing, from which it is unnecessary to remove it, that with the protection described records of much greater length than those ordinarily used may be employed, and that the records cannot be injured by ordinary handling.

I claim as my invention—

1. In combination with a phonograph-record, and a shaft to which it is secured, a casing for the said record adapted to be held stationary while the record is in rotation, the said casing being provided with a slot through which the style may pass to contact with the surface of the record, substantially as specified.

2. In combination with a phonograph-record and its core, an enveloping casing having a style-slot, which casing is loosely supported from the said core, and adapted to be held stationary when the core and its record are rotated, substantially as, and for the purpose specified.

JOHN R. HARE.

Witnesses:

OREGON MILTON DENNIS,
ESTEP T. GOTT.

070.1.1.66

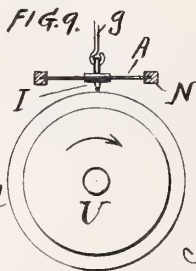
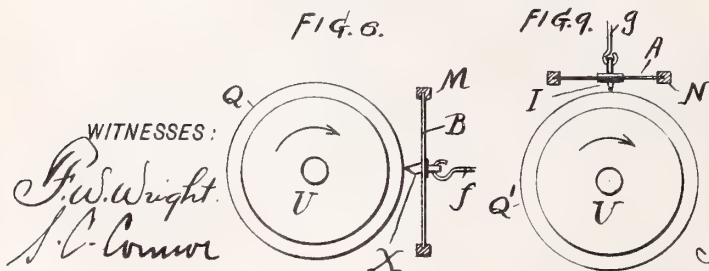
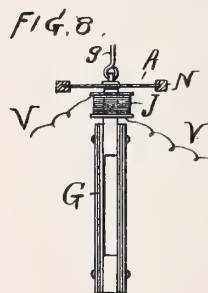
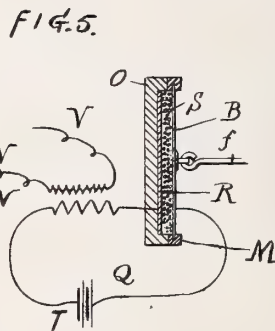
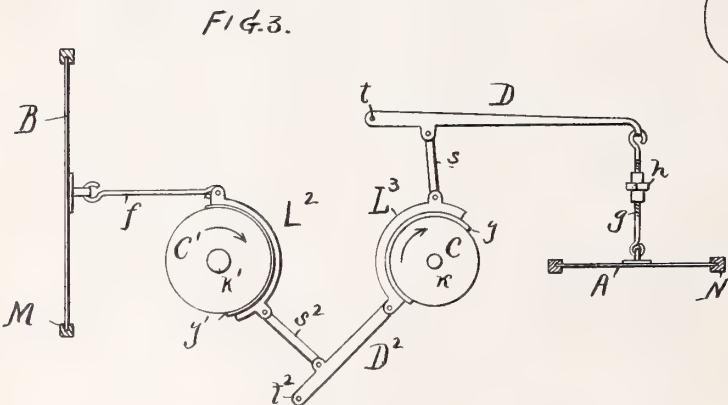
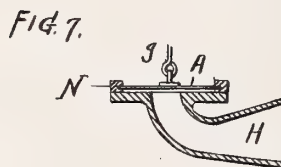
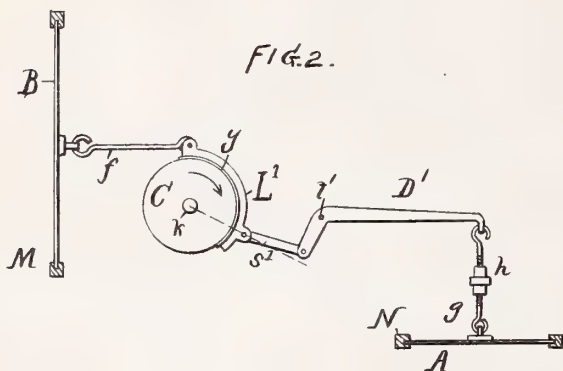
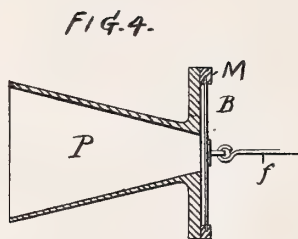
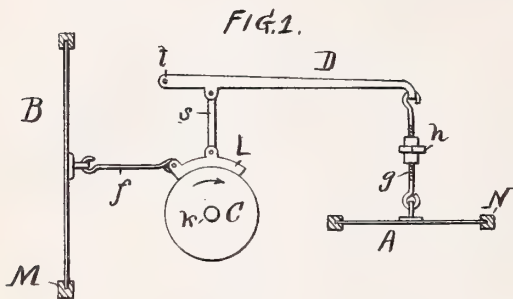
No. 678,566.

Patented July 16, 1901.

D. HIGHAM.
PHONIC APPARATUS.

(Application filed Apr. 25, 1901.)

(No Model.)



WITNESSES:
G. W. Wright.
S. C. Connor

INVENTOR
DANIEL HIGHAM
BY
Howson and Howson
HIS ATTORNEYS.

UNITED STATES PATENT OFFICE.

DANIEL HIGHAM, OF WINTHROP HIGHLANDS, MASSACHUSETTS.

PHONIC APPARATUS.

SPECIFICATION forming part of Letters Patent No. 678,566, dated July 16, 1901.

Application filed April 25, 1901. Serial No. 57,454. (No model.)

To all whom it may concern:

Be it known that I, DANIEL HIGHAM, a citizen of the United States of America, residing in Winthrop Highlands, in the county of Suffolk, State of Massachusetts, have invented Improvements in Phonic Apparatus, of which the following is a specification.

My invention relates to phonic apparatus and comprises means whereby a vibrating energy corresponding to sound-waves can be reproduced with increased power, the object being to produce megaphonic effects from relatively microphonic conditions.

In phonographic work the purpose of my invention is to make the engraving-stylus of the recording apparatus vibrate with greater power than if operated directly from the vibrating diaphragm responding to sound-waves, so as to produce a record of relatively loud-speaking qualities, and to make the speaking-diaphragm of the reproducing apparatus vibrate with greater power than if operated directly from the engraved undulations upon the moving record, and so to produce a relatively loud-speaking or megaphonic effect, and also to reproduce one phonographic record from another, so that the reproduced record may have louder speaking qualities than the original. In telephonic work the object of my invention is to make the vibrating energy imparted to the microphone of the transmitter have greater power than the vibrating energy imparted to the diaphragm by sound-waves and to make the vibrating energy corresponding to sound-waves imparted to the diaphragm of a telephonic receiver have greater power than if operated directly from the line in the usual way, and also to make the reproduced vibrating energy of a telephone-repeater have greater power than the vibrating energy received. Generally in connection with any phonic apparatus the purpose of my invention is to enable a vibrating energy corresponding to sound-waves to reproduce relatively megaphonic effects or conditions.

In this specification I shall call the vibrating energy desired to be reproduced with increased power the "primary" vibrating energy and that reproduced the "secondary" vibrating energy.

In the accompanying drawings, Figure 1

represents diagrammatically the elements of my invention in a simple form. Fig. 2 is a similar diagram of a modification, and Fig. 3 shows the elements compounded. Figs. 4, 5, and 6 show different forms of means which may be employed in connection with my invention to respond to secondary vibrating energy, and Figs. 7, 8, and 9 show different means which may be employed to respond to primary vibrating energy.

In Fig. 1, A is a diaphragm illustrative of means to respond to primary vibrating energy supported by a frame N, (shown in cross-section,) and B is a diaphragm illustrative of means to respond to secondary vibrating energy supported by a frame M. C is a roller supported by a spindle *k*, revolved in the direction of the arrow at a constant rate of speed from any suitable source of motive power. D is a lever having a fulcrum at one end at *t* and connected at the other end to the diaphragm A by an adjustable link *g*. L is a shoe bearing upon the roller C and connected by a link *s* to the lever D at a point effective to obtain greater mechanical force upon the roller C by the shoe L, which is connected by a link *f* to the diaphragm B. A right and left handed threaded nut *h* serves for adjustment of the link *g* to obtain such retractile pull by the diaphragm A upon the lever D as will give the desired pressure of shoe L upon the roller C.

The operation is as follows: The tensional pull exerted by the diaphragm A through the adjustable link *g* upon the lever D, obtained in the present instance by proper adjustment of screw-nut *h*, will cause the lever D to exert a pressure through link *s* and shoe L upon roller C of several times the amount of pull exerted by diaphragm A upon lever D through link *g*, and the steady rotation of roller C, driven from a suitable source of motive power, will act upon shoe L by resultant friction therewith to pull the diaphragm B through the link *f* to a position where the retractile pull of diaphragm B will just overcome the frictional pull exerted by roller C upon shoe L. Now any variation in the tensional pull exerted by diaphragm A upon lever D will of course cause a corresponding variation in pressure of the shoe L upon the roller C, with a resultant variation in position

of the diaphragm B, as will be readily understood, and inasmuch as the leverage of lever D is such as to cause the pressure of shoe L upon roller C to be several times the tensional pull exerted by the diaphragm A it follows that with a frictional coefficient of 1 for the shoe L upon roller C the frictional pull exerted upon the diaphragm B will be several times the pull exerted by the diaphragm A or as the ratio of increased leverage of lever D. It will therefore be readily understood that a primary vibrating energy corresponding to sound-waves set up at the primary end of the lever D by diaphragm A will cause a secondary vibrating energy of several times the power to be set up at diaphragm B.

In Fig. 2 I show the shoe L' as extending partly around roller C and as faced with cloth or other suitable material y to prevent squeaking sounds which may result from the friction necessitated by the rotation of the roller C. This extending of the shoe L' is to secure by mechanical bite the necessary coefficient of friction which the cloth might not otherwise effect. A modification of lever D' and position of its fulcrum t' are also shown, which will be readily understood. In this figure I show the link s' as leaning slightly back of the radial line (shown in dashes) in relation to direction of rotation of the roller C. This I have found to be desirable for good working of the apparatus.

In Fig. 3 I have shown the elements of my invention as compounded, there being an additional roller C' on a spindle k' of larger proportion, a shoe L² and cloth y' , a lever D² on fulcrum t^2 , and a link s^2 , whereby the already-increased vibrating energy set up at the shoe L², which acts on roller C, will be taken up by lever D² and transmitted to shoe L² and again reproduced with still further increased vibrating energy, as will also be readily understood.

The primary vibrating energy of my invention may be set up by vocal sounds spoken directly against diaphragm A, or it may be set up by the magnetic effect of an undulating electrical current corresponding to sound-waves, or it may be set up by the inscribed undulations upon a moving phonographic record corresponding to sound-waves, while the secondary vibrating energy may be made to produce sound-waves directly from the vibration of the diaphragm B, or it may be made to produce undulations of an electrical current corresponding to sound-waves, or it may be made to inscribe the undulations upon a moving phonographic record, all of which I have illustrated in the drawings by Figs. 4, 5, 6, 7, 8, and 9.

In Fig. 4 the diaphragm B, frame M, and a portion of the link f shown in Fig. 1 are shown, with the same letters of reference in connection with a horn P, as constituting means whereby the vibrating energy of my invention may be made to produce sound-

waves for loud-speaking effects, as will be readily understood.

In Fig. 5 the diaphragm B, frame M, and portion of link f are shown, with the same letters of reference as in Fig. 1, in connection with an inclosing frame O, supporting granulated carbon S between the diaphragm B and a plate R in circuit Q with battery T and the primary side of an induction-coil W, having secondary terminals V, running to a telephonic line, as constituting means whereby the secondary vibrating energy of my invention may be made to produce undulating electrical currents corresponding to sound-waves.

In Fig. 6 the diaphragm B, frame M, and portion of link f are shown, in connection with a blank phonographic cylinder Q, revolved around an axis U in the direction of the arrow and advanced by any usual means against a cutting-stylus X, supported for clearness of illustration by diaphragm B, as constituting means whereby the secondary vibrating energy of my invention may be made to produce a phonographic record.

In Fig. 7 the diaphragm A, frame N, and portion of link g of Fig. 1 are shown with the same letters of reference in connection with a speaking-tube H, whereby the primary vibrating energy of my invention may be imparted to the diaphragm A by sound-waves entering tube H.

In Fig. 8 the diaphragm A, frame N, and portion of link g are shown, in connection with a well-known form of telephonic receiver-magnet G, to operate magnetically upon the diaphragm A, whereby primary vibrating energy may be imparted to the diaphragm A by undulations of current corresponding to sound-waves flowing through coil J, having terminals V running to the line.

In Fig. 9 the diaphragm A, frame N, and portion of link g are shown, in connection with a recorded phonographic cylinder Q', revolved around an axis U in the direction of the arrow and advanced by usual means against a tracing-stylus I, supported by the diaphragm A, whereby primary vibrating energy may be imparted to the diaphragm A or primary end of lever D by the inscribed undulations corresponding to sound-waves upon the moving record.

As the secondary vibrating energy of my invention will be several times more powerful than the primary vibrating energy, it will now be readily understood that a phonographic record of relatively loud-speaking qualities can be produced from sound-waves by the use of primary means, such as shown in Fig. 7, and secondary means, such as shown in Fig. 6, or a phonographic record can be reproduced from another, so as to give louder speaking qualities than the original, if desired, by the use of the primary means shown in Fig. 9 and secondary means shown in Fig. 6, while the use of primary means, such as shown in Fig. 9, and secondary means, such as shown in Fig. 4, will produce loud-speak-

ing phonographic effects. The use of the devices shown in Figs. 7 and 5 will give a powerful telephonic transmitter. The use of the means shown in Figs. 8 and 4 will give a
 5 loud-speaking telephonic receiver, while the devices shown in Figs. 8 and 5 will constitute a telephonic repeater.

To successively reproduce the overtones of vocal or instrumental sounds in connection
 10 with this invention, it is advisable that the coefficient of friction of the frictional contact upon the moving surface should not be much, if any, more than one, or, in other words, the frictional force set up by the moving surface
 15 should not be more, if any, than the pressure holding the parts in contact, otherwise a tendency of instability of contact may take place, which will completely destroy many, if not all, of the overtones and reproduce only the
 20 fundamental tones, so as to greatly impair, if not destroy, the usefulness of the apparatus. It will be seen from this that if the primary vibrating force were made use of directly to vary the pressure of the frictional means
 25 without the intervention of a lever no great secondary vibrating force would be produced if the coefficient of friction were 1, since the frictional vibrating force set up would in this case only equal the vibrating force set
 30 up at the primary vibrating means. The vital element of my invention, therefore, is the lever means connected between the primary vibrating means and the frictional means, whereby the frictional vibrating force can be
 35 increased as the ratio of the increased me-

chanical force of the lever means with a coefficient of 1.

It will be apparent that various modifications of the precise form of construction herein shown and described may be made without departing from the scope of my invention
 40 and that any number of frictional means may be used compoundedly.

I claim as my invention—

1. In an apparatus for reproducing, with
 45 increased power, a vibrating energy corresponding to sound-waves, the combination of a lever means, effective of increased mechanical force, with a primary vibrating means
 50 actuating said lever means, a frictional means controlled by said primary means through said lever means, and a secondary vibrating
 55 means actuated by said frictional means, substantially as and for the purpose described.

2. In an apparatus for reproducing, with
 55 increased power, a vibrating energy corresponding to sound-waves, the combination of lever means and frictional means compounded, with primary vibrating means actuating
 60 said compounded means, and secondary vibrating means actuated by said compounded means, substantially as and for the purpose described.

In testimony whereof I have signed my name to this specification in the presence of
 65 two subscribing witnesses.

DANIEL HIGHAM.

Witnesses:

A. N. BONNEY,
 E. T. HIGHAM.



No. 679,236.

Patented July 23, 1901.

T. H. MACDONALD.
GRAPHOPHONE.

(Application filed Mar. 14, 1901.)

(No Model.)

Fig. 1.

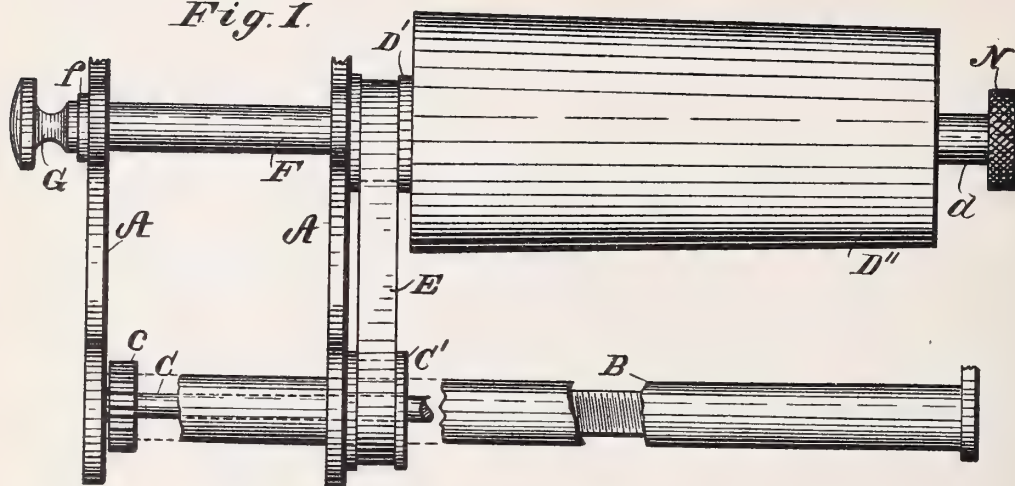


Fig. 2.

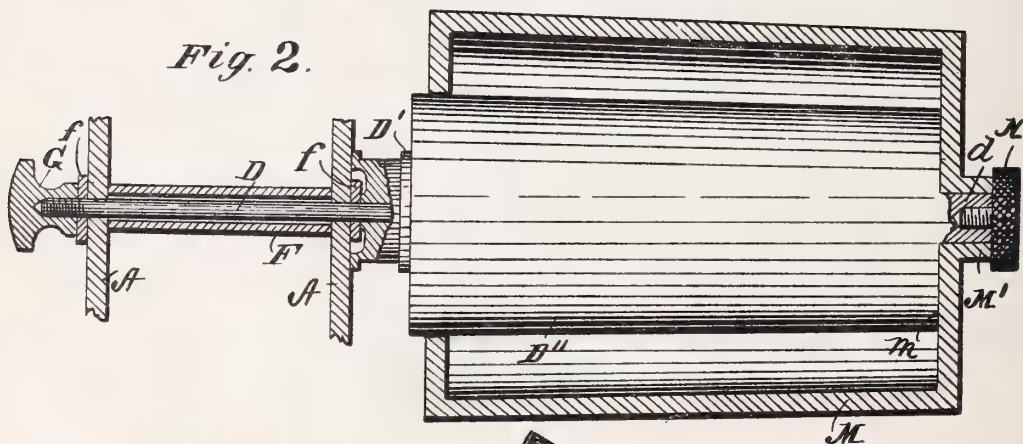
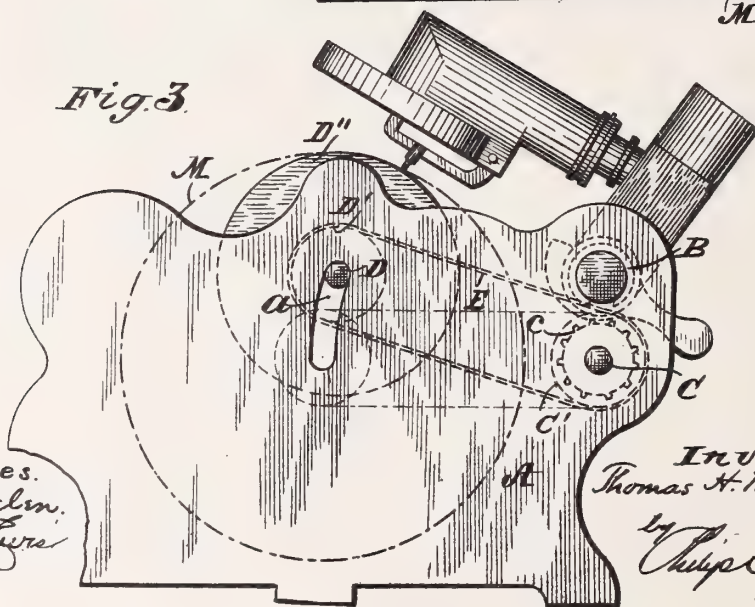


Fig. 3.



Witnesses.
H. Edelin.
H. J. Fure.

Inventor.
Thomas H. Macdonald
by Philip Mauro
his atty.

UNITED STATES PATENT OFFICE.

THOMAS H. MACDONALD, OF BRIDGEPORT, CONNECTICUT, ASSIGNOR TO
AMERICAN GRAPHOPHONE COMPANY, OF WEST VIRGINIA.

GRAPHOPHONE.

SPECIFICATION forming part of Letters Patent No. 679,236, dated July 23, 1901.

Application filed March 14, 1901. Serial No. 51,165. (No model.)

To all whom it may concern:

Be it known that I, THOMAS H. MACDONALD, of Bridgeport, Connecticut, have invented a new and useful Improvement in Graphophones, which is fully set forth in the following specification.

This invention relates to graphophones or talking-machines, more particularly to a machine for carrying either the standard records (or blanks) or those of larger diameter, known as "grand" records and blanks.

The arrangement consists, first, in placing on the ordinary mandrel an outer mandrel or shell of sufficient diameter to carry the grand cylinder, and, second, in shifting the mandrel-rod, with its mandrel and shell, so that the speaker (recorder or reproducer) shall have proper relation with the surface of the cylinder. One advantage of this latter feature consists in doing away with any "extra neck" or similar device necessary in shifting the speaker relative to the record-surface, in that the record-surface itself is shifted.

The invention consists, further, in certain details of construction, to be pointed out. Briefly, the shifting of the mandrel-rod is provided for by mounting it adjustably in curved bearing-slots that are concentric with the shaft from which the mandrel receives motion, hereinafter called the "driving-shaft." By reason of this mounting, since the slots are curved concentric with the driving-shaft, the mandrel is always in revoluble connection with its driving-shaft at any position of its adjustment.

In the drawings annexed to illustrate one embodiment of my invention, Figure 1 is a plan; Fig. 2, a longitudinal section, and Fig. 3 a detail end view.

While my invention is applicable to various types of machines, I have shown it as applied to that type known commercially as the "Eagle" graphophone.

A A are the usual bearing-plates, between which are located the driving-spring, governor, gearing, &c., all as usual.

B is the split sleeve encircling the feed-screw.

C is what I shall here call the "driving-shaft," that receives motion through gear *c* from the driving-spring and intermediate

gearing. (Not shown.) On the outer end of shaft C is a pulley C'.

D is the mandrel-rod.

Plates A are extended to the rear more than has been usual heretofore, and each has the curved slot *a*, that register with each other and are concentric with the shaft C. On the mandrel-rod turn the ordinary pulley D' and taper-mandrel D''. A belt E, driven by pulley C', turns pulley D' and the mandrel. Thus in any position of rod D within its curved-slot bearings *a* the mandrel is always ready to be rotated by the shaft C.

For holding the mandrel-rod in its different positions of adjustment I provide sleeve F, placed between plates A and surrounding rod D, thumb-nut G, turning down on the screw-threaded end of rod D, and washers *f f*, on the outer sides of plates A and adjacent to the thumb-nut and pulley D', respectively. The slots are so situated and extend to such position that when the mandrel-rod is raised to its upper limit (against the upper ends of the slots) then the standard cylinder on the standard mandrel will be in proper position relative to the reproducing (or recording) stylus, while when the mandrel-rod is shifted to its lower position (at the bottom of the slots) and the outer mandrel (to be described hereinafter) is put in place the grand cylinder on said outer mandrel will then be in proper relation to the stylus. The belt E serves as a sort of radius-vector, and owing also to the snug fit of sleeve F between plates A the mandrel-rod D is always parallel to the driving-shaft C, as well as equidistant therefrom. Tightening thumb-nut G clamps the mandrel-rod in its adjusted position.

For carrying grand cylinders I have provided a false mandrel or shell M, having an opening at one end to fit upon the inner end of mandrel D'' and the hollow neck M' and shoulder *m* at its other end to take over stem *d* of the standard mandrel and abut against the outer end thereof, all as seen in Fig. 2. A thumb-nut N, screwed into the end of stem *d* of mandrel D'', serves to hold the outer mandrel in place.

The great advantage of my invention as a whole consists in the ease, rapidity, and accuracy of its adjustment for the different-

sized cylinders. When a small record is in place, to substitute a larger first remove the record; second, loosen thumb-nut G; third, shift the rod F to the bottom of slots and tighten nut G; fourth, apply mandrel M and large record, and, fifth, tighten thumb-nut N. All this has been done in some seven to ten seconds, and the adjustment is perfect. The reverse of this operation can be performed in even less time.

Of course instead of belt E power may be transmitted from shaft C to the mandrel by other means, or some other driving device may be employed in place of shaft C, and other changes may be made without in any case departing from the spirit of my invention, which lies, broadly, in shifting the position of the sound-record (or blank) relative to the "speaker," in order to bring either the standard record (or blank) or that of larger size into proper relation to the speaker.

Having thus described my invention, I claim—

1. In a talking-machine, the combination with a driving device, of an adjustably-mounted mandrel always in rotatable connection therewith, and means for holding the latter firmly in its various adjustments, substantially as described.

2. In a talking-machine, the combination with a driving-shaft journaled in bearing-plates, of a mandrel-rod carried by said plates in curved bearing-slots that are concentric with said driving-shaft, and a connection from said driving-shaft that turns the mandrel on said rod, substantially as described.

3. In a talking-machine, the combination with bearing-plates and a driving-shaft journaled therein, of an adjustable mandrel-rod supported by said plates within curved bearing-slots that are concentric with said driv-

ing-shaft, a sleeve surrounding that portion of the mandrel-rod between said plates and abutting against the latter, and means for holding said mandrel-rod in its adjustment, substantially as described.

4. In a talking-machine, the combination with a driving-shaft, and a mandrel adjustably mounted so as to be always parallel therewith and equidistant therefrom, of an outer mandrel detachably mounted on said mandrel, substantially as described.

5. In a talking-machine, the combination with a driving device, and an adjustable mandrel so mounted that it may—at pleasure—carry in operative position either a standard cylinder or one of larger diameter, substantially as described.

6. In a talking-machine, the combination with the speaker thereof (recorder or reproducer), of an adjustable mandrel capable of being revolved in any of its positions of adjustment, and adapted to carry either a large or a small record-cylinder in operative contact with said speaker, substantially as described.

7. In a talking-machine, the combination with a speaker (recorder or reproducer), and a revoluble device for carrying a cylinder, of means for adjusting said device relative to said speaker to enable the former to carry—at pleasure—cylinders of different diameters in operative contact with said speaker, substantially as described.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

THOMAS H. MACDONALD.

Witnesses:

M. A. FOGO,

W. R. MILLER.

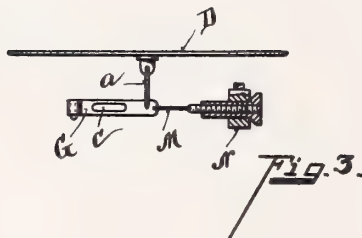
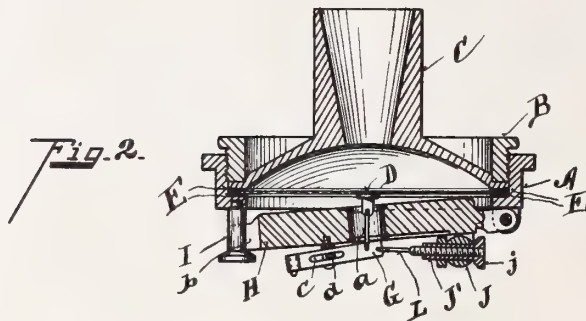
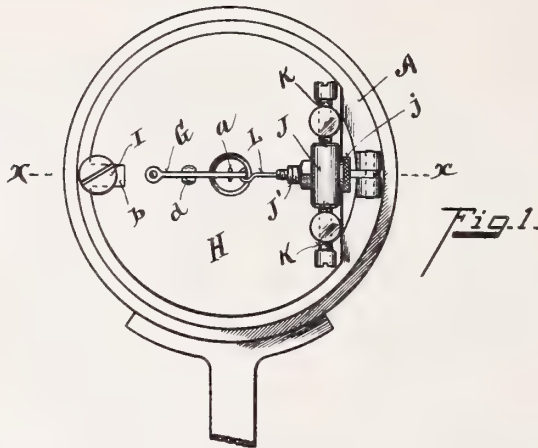
No. 679,467.

Patented July 30, 1901.

C. W. NOYES.
PHONOGRAPH REPRODUCER AND RECORDER.

(Application filed Mar. 21, 1901.)

(No Model.)



Inventor

Witnesses
Oliver B. Kaiser
Pearl M. Michay

Charles W. Noyes
By Wood & Wood Attorneys

UNITED STATES PATENT OFFICE.

CHARLES W. NOYES, OF CINCINNATI, OHIO, ASSIGNOR OF ONE-HALF TO
ILSEN & COMPANY, OF SAME PLACE.

PHONOGRAPH REPRODUCER AND RECORDER.

SPECIFICATION forming part of Letters Patent No. 679,467, dated July 30, 1901.

Application filed March 21, 1901. Serial No. 52,126. (No model.)

To all whom it may concern:

Be it known that I, CHARLES W. NOYES, a citizen of the United States, residing at Cincinnati, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Phonograph Reproducers and Recorders, of which the following is a specification.

The object of my invention is to improve the tone and quality of a phonographic reproducer or recorder and to do away with the metallic sound as far as possible.

I have produced a mechanism adapted to compensate for the different physical attributes and characteristics of different diaphragms. Glass diaphragms are now more universally employed than any other, because the quality of tone is found to be better with glass than with other material; but it is universally found in practice that whenever a different diaphragm is placed in the reproducer or recorder a different tone results. This difference is probably due to several causes—to different thickness and to differences in other physical characteristics.

My invention enables the instrument to be adjusted so as to compensate for these variations of the diaphragms and consequent variations in the tone, whereby a given operator can produce the same quality of tone from different glasses or diaphragms having the varying characteristics as specified.

The features of my invention will be more fully set forth in the description of the accompanying drawings, forming a part of this specification, in which—

Figure 1 is a bottom plan view of my improvement. Fig. 2 is a section on line *x x*, Fig. 1. Fig. 3 is a modification of the stylus-lever and attachments.

In the accompanying drawings the figures are slightly enlarged for better representing the parts.

A represents the ordinary reproducer-cup; B, the clamping-ring for securing the same; C, the tube-plate; D, the diaphragm; E E, the gaskets which are placed upon each side of the glass, so as to cushion the same.

a represents the link, which connects the diaphragm with the stylus-lever G. H rep-

resents a plate hinged to the cup A. I represents the limiting-weight screw, which passes through the slot *b* in the plate H, so as to limit the downward movement of the weighted plate. These parts, except the stylus-lever, are of the ordinary construction.

The stylus-lever is provided with a longitudinal slot *c*, (shown in Figs. 2 and 3,) through which the fulcrum *d* passes. This slot is provided for the purpose of adjusting the stylus-lever longitudinally on its center to compensate for the varying thickness or quality of the diaphragm. In the preferred form of construction shown in Fig. 2 the following devices are provided for the purpose of enabling this adjustment to be readily made by the operator when the phonograph is in position for use.

J represents a rock-shaft which is supported on gimbal-point center screws K K, so that a sensitive movement thereof may be obtained.

L represents a link connected to the screw J', tapping through the lever J. Said link is hooked into the stylus-lever G, forming a jointed connection.

j represents the head of the screw J' for turning the screw out or in, so as to move the stylus-lever G on its fulcrum, and thereby adjust it to the required position to suit the quality of the diaphragm employed.

It will be remembered that the stylus-point has but a very small motion due to the recording or reproducing sound-waves. There is also a vertical movement of the limiting-weight to accommodate the instrument to the inequalities of the record or cylinder. Owing to the slight movement of the stylus for making or receiving impressions, the connection between the adjusting-screw and the stylus-lever must be very delicate, so as not to interfere with the free movement of the same.

In Fig. 3 I have shown a modified form of making a connection between the adjusting-screw and the stylus-lever, which consists of a thin elastic or flexible plate or wire M, the ends of which are secured to the lever and screw-shank. It is sufficiently long between the attaching-points, however, to flex readily under the slightest vibrations of the dia-

phragm. In this construction it will be seen that a single fixed post N is all that is required, as the flexing of the connecting-plates M is sufficiently delicate to allow the free movement of the stylus-lever and yet hold it in place. This construction obviates the necessity of the rock-lever J. (Shown in Fig. 2.) I have shown these two forms simply to illustrate the fact that variations may be made in the means for shifting the relative positions of the fulcrum and lever. I do not wish to limit myself to the specific forms herein shown or described.

It will be observed that in the preferred form I have shown the adjusting mechanism, while adapted to vary the leverage of the stylus, is entirely flexible in the direction to and from the diaphragm and substantially rigid or unyielding in the direction of adjustment, the tension being sufficient in degree to prevent such shifting of the lever on the fulcrum when the device is in operation as would make any practical variation in the results produced.

I have discovered that different diaphragms applied to the same reproducer produce different tones, due to the varying physical characteristics of the respective diaphragms, and that by shifting the position of the fulcrum relative to the stylus to lengthen or shorten the leverage these physical differences in the diaphragms may be compensated for, so that all may be made to produce a standard tone, or the tones may be varied within given limits to suit the ear of the operator.

Having described my invention, I claim—

1. In a phonograph reproducer or recorder, the combination of a stylus-lever, a fulcrum, and means for adjusting and fixing the leverage of the stylus, whereby the varying tones

of different diaphragms may be compensated for, substantially as specified.

2. In a phonograph reproducer or recorder, a fulcrum, a stylus-lever, provided with a slot admitting of different relative positions of the fulcrum and stylus, and means for adjusting and fixing said fulcrum and stylus in different relative positions, substantially as specified.

3. In a phonograph reproducer or recorder, a fulcrum, a stylus-lever provided with a slot admitting of different relative positions of the fulcrum and stylus, and an adjusting mechanism attached to the free end of the lever, substantially as specified.

4. In a phonograph reproducer or recorder, a fulcrum, a stylus-lever provided with a slotted bearing for the fulcrum, and adjusting means attached to the free end of the stylus adapted to hold the stylus to its position of adjustment, but permitting free pivotal movement in the direction of the diaphragm, substantially as specified.

5. In a phonograph reproducer or recorder, a fulcrum, a stylus-lever provided with means for shifting the fulcrum position, flexible in the direction of the diaphragm and substantially rigid in the direction of adjustment, substantially as specified.

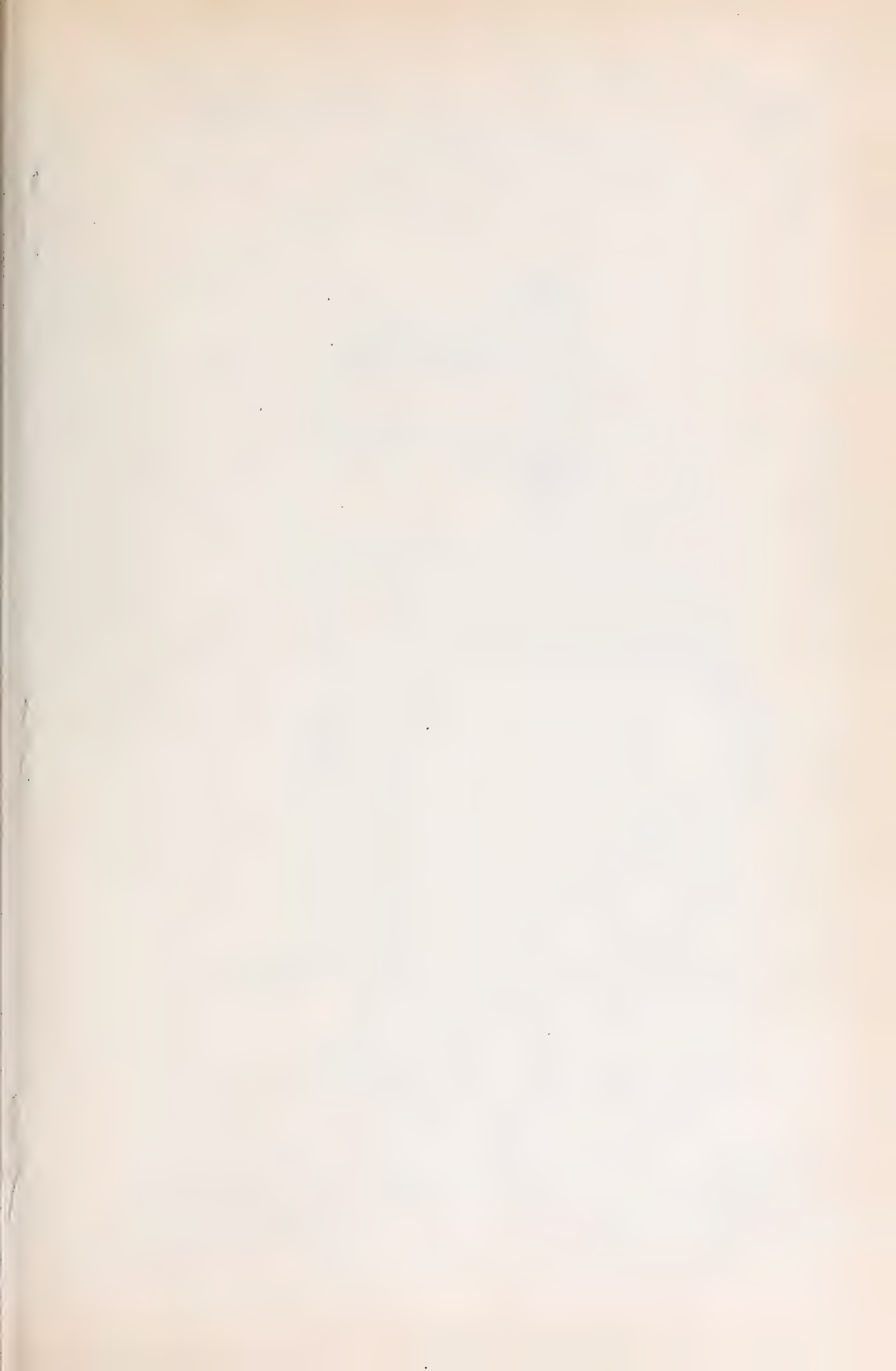
6. In a phonograph reproducer or recorder, a fulcrum, a stylus-lever, and means for shifting the fulcrum position of the stylus-lever, said means being flexible in the direction of the diaphragm, substantially as specified.

In testimony whereof I have hereunto set my hand.

CHARLES W. NOYES.

Witnesses:

OLIVER B. KAISER,
PEARL MCMICHAEL.



No. 679,896.

Patented Aug. 6, 1901.

E. R. JOHNSON.

SOUND BOX FOR TALKING MACHINES.

(Application filed May 2, 1901.)

(No Model.)

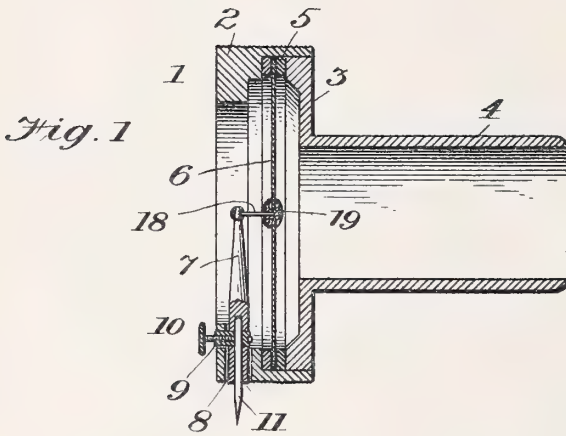


Fig. 2.

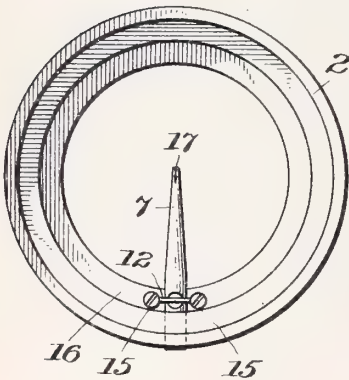


Fig. 3.

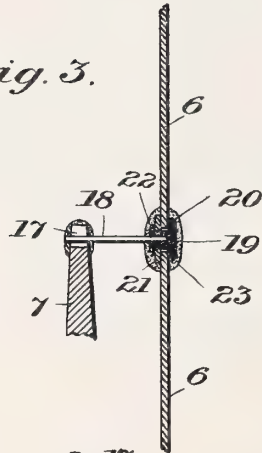


Fig. 4.

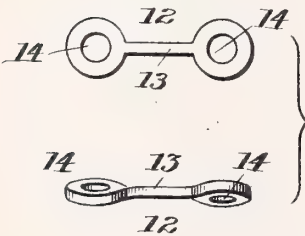


Fig. 5.

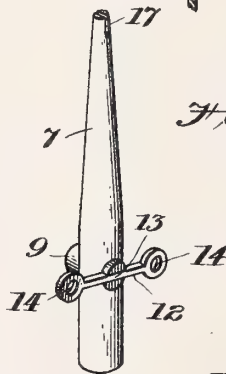
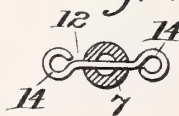


Fig. 6.



Witnesses.

Jno. S. Cross.
Chas. F. Bennett.

Inventor,

Eldridge R. Johnson,

by *Horace Pettit*
his Attorney.

UNITED STATES PATENT OFFICE.

ELDRIDGE R. JOHNSON, OF PHILADELPHIA, PENNSYLVANIA.

SOUND-BOX FOR TALKING-MACHINES.

SPECIFICATION forming part of Letters Patent No. 679,896, dated August 6, 1901.

Application filed May 2, 1901. Serial No. 58,459. (No model.)

To all whom it may concern:

Be it known that I, ELDRIDGE R. JOHNSON, a citizen of the United States, and a resident of the city of Philadelphia, State of Pennsylvania, have invented certain new and useful Improvements in Sound-Boxes for Talking-Machines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

This invention relates to certain improvements in talking-machines, and particularly to an improved construction of sound-box for use on sound-reproducing machines.

The object of the present invention is to provide an improved form of sound-box whereby the volume and quality of tone of the reproduction in machines of this character are rendered much clearer and more distinct, and natural than heretofore. In order to accomplish this object and to produce the advantages arising therefrom, I have found it necessary to provide a very delicate connection between the diaphragm and the stylus-bar, also to provide an extremely-sensitive mounting for the stylus-bar, so that the said bar will readily yield under the action of the most minute vibrations of the stylus-point and transmit said vibrations to the diaphragm. I have also found that the adjustment of the diaphragm in the sound-box frame must be very accurate in order to produce the finest results, and although this diaphragm must be free to vibrate throughout its entire area at the same time it must not be loose; otherwise during the reproduction it would rattle, and thereby produce a hollow or unnatural sound. So in order to remedy or provide against this defect I have confined the diaphragm between two yielding gaskets and constructed the sound-box frame in two sections, one fitting within the other, and these two sections are preferably driven together by machinery, confining the diaphragm and gaskets between them with a very fine adjustment. This construction practically renders the two sections of the sound-box frame integral, so that they cannot be disengaged by hand, and therefore the proper adjustment of the diaphragm cannot be disturbed.

My invention resides mainly in the above-mentioned features and in the general ar-

range and combination of the various parts, such as more fully described hereinafter and specifically pointed out in the claims made hereto.

In the accompanying drawings, Figure 1 is a sectional elevation of a sound-box embodying my invention. Fig. 2 is a rear elevation of the front section of the sound-box frame having the diaphragm removed and stylus bar or holder in position. Fig. 3 is an enlarged detail section illustrating the connection between the stylus-holder and the diaphragm. Fig. 4 illustrates the spring which holds the stylus-bar under tension in plan view and side elevation on an enlarged scale. Fig. 5 is an enlarged perspective view of the stylus-bar and its spring detached from the sound-box frame. Fig. 6 is a detail view illustrating another way of securing the spring to the stylus-bar.

Referring to the said drawings, 1 designates the sound-box frame, which comprises two sections 2 and 3. The section 3 has formed thereon the usual tubular section 4 for attachment to the horn and supporting-arm of the reproducing-machine. The section 2 is provided with a seat or shoulder for the reception of the circular gaskets 5, which are placed on each side of the diaphragm 6, and the disk portion of the section 3 bears against the outer gasket, thus confining the peripheral edges of the diaphragm between these two gaskets without clamping the same, as the said diaphragm should be free to vibrate throughout its entire area, though to quite a minute degree. These two gaskets must be very nicely adjusted with relation to the diaphragm, because if the said diaphragm is too loose at its edges a rattling and unnatural sound will be produced, or if the said diaphragm is too tightly confined between these gaskets the vibrations of the same will be retarded or dampened to such an extent as to decrease or impair the volume and quality of tone of the reproduction. In order that the proper adjustment of the diaphragm may be effected, I preferably drive the sections 2 and 3 of the sound-box together by a special machine designed for this purpose, so that after they are properly put together this adjustment cannot be disturbed by handling or by the carelessness of the user.

The stylus-bar 7 is mounted loosely in an aperture 8, formed in the section 2 of the frame 1. This aperture 8 should be somewhat larger than the said stylus-bar, so as to permit of the vibrations of said bar. A boss 9 is welded or brazed in the bar 8, having a threaded aperture extending into the style-socket for the reception of the set-screw 10, which holds the style 11 in position. This boss 9 extends through a slightly-enlarged aperture formed in the face of the sound-box section, as illustrated in Fig. 1 of the drawings.

The spring 12 is secured to the rear of the stylus-bar 7, preferably by inserting the central portion of the same in a recess formed in the stylus-bar and then brazing or soldering the same, so as to hold it securely to the said bar. This spring 12 is made of finely-tempered steel, having a central portion 13, which is preferably of equal thickness, the proportion being about one-fiftieth of an inch. Each end is provided with an enlargement having apertures 14 for the reception of the securing-screws 15. Each end of the spring 12 is twisted or bent in opposite directions, as illustrated in the side elevation, Fig. 4, of the drawings, this view being exaggerated for the purpose of more clearly showing the twist.

Instead of making the spring 12 of flat steel and securing the same to the stylus-bar 7 on one side thereof it can be made of steel wire about one-fiftieth of an inch in diameter, having each end shaped to form a loop for the reception of the securing-screw 15, as shown in Fig. 6 of the drawings. When this construction is used, I preferably secure it to the stylus-bar by drilling a hole through said bar and passing the steel wire therethrough before forming the eyes 14. I then braze the same to the stylus-bar, form the eyes 14, and then spring or twist the extending ends or fingers in opposite directions in the same manner as with the flat spring before described. If the spring should pass through the style-socket, it could be drilled out after brazing, as only the projecting fingers of said spring would have any function to perform when this manner of securing is used.

After the spring 12 is secured to the stylus-bar and the said bar is adjusted in its aperture 8 the two ends are secured to the cut-out or shouldered portion 16 of the sound-box casing by means of the screws 15. When these screws 15 are screwed in tightly, the said spring is straightened out, which renders its intermediate portion extremely sensitive and under a high tension; and by reason of its connection with the stylus-bar 7 this said bar becomes neutralized and extremely sensitive to the most minute vibrations of the stylus-point.

The upper end of the stylus-bar 7 is provided with a slit 17, in which rests the end of a thin copper wire 18. After inserting the wire 17 in the slit said slit is clenched together and a coating of wax applied around the joint. The other end of the wire 18 is secured in a

head 19, composed of solder or platinum, the said head passing through an aperture formed in the center of the diaphragm 6. A flange 20 is formed on the head 19, which bears against the inner face of the diaphragm. On the other side of the head is placed a thin metal washer 21, which bears against the diaphragm and is held in position by upsetting the end of the said head 19 to form a flange 22, thus providing a connection such as illustrated on an exaggerated scale in Fig. 3 of the drawings. After the connection is thus formed a coating of wax, as 23, is preferably placed over the same on each side of the diaphragm for more securely sealing the connection.

I have found the above-described connection to produce the finest results when used in connection with the delicately-mounted stylus-bar, the tones of the reproduction being devoid of all harshness, and very clear, distinct, and sharp and far superior to any reproduction of sound heretofore produced in my experience.

By placing or mounting the stylus-bar inside of the casing I obviate any danger of breaking the connection with the diaphragm should the sound-box be dropped or rested upon its face. This is a decided advantage, as I have been frequently called upon to repair a great many sound-boxes where this connection has been broken by careless handling and where the diaphragm has been cracked or permanently injured in the same manner. If the box should be dropped on the point of the stylus, the connection between the stylus-holder is strong enough to resist this, and the wire 18 will yield slightly upwardly without in any manner affecting the said connection.

While I have described the diaphragm as being practically free at its edges, it is clear that while this construction of adjustment is preferable my improvements herein described and claimed are applicable to constructions wherein the diaphragm may be clamped at its edges. It is also clear that I do not limit myself to the exact constructions herein described, as modifications might be made without departing from the spirit and scope of the features of my invention as hereinafter claimed.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a sound-box, a spring-mounting for the stylus-bar, comprising a thin piece of tempered steel having its ends twisted in opposite directions, and secured to the sound-box casing, and its intermediate portion secured to the stylus-bar.

2. In a sound-box, a spring-mounting for the stylus-bar comprising a strip of tempered steel having screw-holes provided in each end and the said ends twisted or sprung in opposite directions so as to render the intermediate portion extremely sensitive, the said in-

intermediate portion being rigidly secured to the stylus-bar, and the end portions to the sound-box casing, thereby rendering the stylus-bar sensitive, for the purpose described.

5 3. The combination with the sound-box casing, a diaphragm mounted therein, a stylus-bar mounted in an opening formed in the lower wall of the casing, a tempered-steel spring secured to the said stylus-bar, having
10 its ends twisted in opposite directions and secured to the sound-box casing on each side of the stylus-bar.

4. In a sound-box for talking-machines, a spring-mounting for the stylus-bar comprising
15 tempered-steel fingers extending from each side of the stylus-bar transversely thereto, and the free ends of said fingers adapted to be secured to the sound-box casing.

5. In a sound-box for talking-machines, a
20 spring-mounting for the stylus-bar comprising small tempered-steel fingers extending from each side of the stylus-bar transversely thereto, each of said fingers being twisted or sprung in opposite directions and having their
25 free ends rigidly secured to the sound-box casing.

6. In a sound-box for talking-machines, an annular casing having a radially-disposed aperture provided in its wall, a stylus-holder
30 adapted to pass through said aperture, small tempered-steel fingers extending from the said stylus-bar on each side thereof, each of said fingers being bent or sprung in opposite directions, and having their free ends secured
35 to the sound-box casing, for the purpose described.

7. The combination with the sound-box casing, a diaphragm mounted therein, a stylus-bar mounted in an opening formed in the
40 lower wall of the casing, a wire connection rigid in the direction of its length secured to the diaphragm and to the stylus-bar, a tempered-steel spring secured to the said stylus-bar having its ends twisted in opposite direc-
45 tions, and secured to the sound-box casing on each side of the stylus-bar.

8. The combination with the sound-box casing, a diaphragm mounted therein, a stylus-bar mounted in the casing, a wire connection rigid in the direction of its length secured at one end to the stylus-bar, a head formed on the other end of said wire adapted to an opening in the diaphragm, means for
50 securing said head to the diaphragm, and a tempered-steel spring secured to the stylus-bar having twisted ends, the said twisted ends being secured to the sound-box casing on each side of the said stylus-bar.

9. The combination with the sound-box casing, a diaphragm mounted therein, a stylus-bar mounted in the casing, a wire connection rigid in the direction of its length secured at one end to the stylus-bar, a head formed on the other end of said wire adapted to an opening in the diaphragm, means for securing
65 said head to the diaphragm, a film or seal of wax applied over the said connection and a

tempered-steel spring secured to the stylus-bar having twisted ends, the said twisted ends being secured to the sound-box casing
70 on each side of the said stylus-bar.

10. The combination with the sound-box casing, a diaphragm mounted therein, a stylus-bar mounted in the casing, a wire connection rigid in the direction of its length secured at
75 one end to the stylus-bar, a head formed on the other end of said wire adapted to an opening in the diaphragm, a flange formed on the outer end of said head, a washer secured on said head adapted to bear against the opposite face of the diaphragm, a film or seal of wax applied over the said connection for preventing the same from rattling, and a tempered-steel spring secured to the stylus-bar having twisted ends, the said twisted ends
80 being secured to the sound-box casing on each side of the said stylus-bar.

11. The combination with the sound-box casing, a diaphragm mounted therein so as to be free to move throughout its entire area, a
90 stylus-bar loosely mounted within the casing, a wire connection rigid in the direction of its length secured to the stylus-bar, a head formed on the opposite end of said wire, means for positively connecting this head to the diaphragm, a seal of wax applied over said connection, and a thin twisted spring secured at its middle portion to the stylus-bar and having its twisted ends secured to the sound-box casing on each side of said stylus-bar, for the
100 purpose described.

12. In a sound-box, the combination with the diaphragm, a stylus-bar mounted on the sound-box casing, a wire connection rigid in the direction of its length secured at one end
105 to the stylus-bar, a head formed on the other end of said wire adapted to an opening in the diaphragm, and means for securing said head to the diaphragm.

13. In a sound-box, the combination with
110 the diaphragm and stylus-bar, of a connection between the two comprising a metallic rod or wire rigidly secured to the stylus-bar, a head formed on the other end of said wire adapted to an opening in the center of the
115 diaphragm, a flange formed on the outer end of said head, and a washer secured on said head adapted to bear against the opposite face of the diaphragm, substantially as described.

14. In a sound-box, the combination with
120 the diaphragm, a stylus-bar mounted on the sound-box casing, a wire connection rigid in the direction of its length secured at one end to the stylus-bar, a head formed on the other end of said wire adapted to an opening in the
125 diaphragm, means for securing said head to the diaphragm and a film or seal of wax applied over the said connection.

15. In a sound-box, the combination with the diaphragm and stylus-bar, of a connection between the two comprising a metallic
130 rod or wire rigidly secured to the stylus-bar, a head formed on the other end of said wire adapted to an opening in the center of the

diaphragm, a flange formed on the outer end of said head, a washer secured on said head adapted to bear against the opposite face of the diaphragm, and a film or seal of wax applied over the said connection for preventing the same from rattling.

16. A sound-box for talking-machines comprising a casing made in two sections adapted to fit one within the other the said two sections being driven or shrunk together, a diaphragm confined at its periphery between the two sections, yielding gaskets provided on each side of the said diaphragm, the said parts being adjusted so as to prevent the said diaphragm from rattling yet leaving it free to vibrate throughout its entire area, a stylus-bar

mounted within the casing, a tempered-steel spring having twisted ends which are secured to the casing on each side of the diaphragm, and having its intermediate part secured to the stylus-bar, a wire connection permanently secured to the stylus-bar at one end and to the diaphragm at its other, and a wax seal applied over the connection to the diaphragm, substantially as described.

In witness whereof I have hereunto set my hand this 1st day of May, A. D. 1901.

ELDRIDGE R. JOHNSON.

Witnesses:

CHARLES H. SPECKMAN,
CHAS. K. BENNETT.



L. P. VALIQUET.
SOUND REPRODUCER.
(Application filed Dec. 19, 1898.)

(No Model.)

Fig. 1.

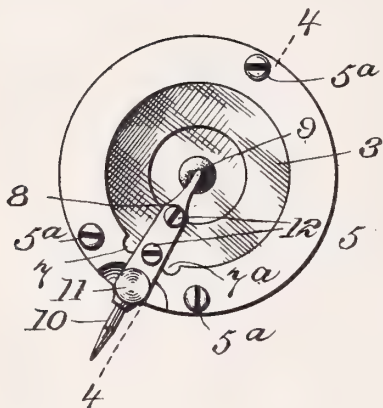


Fig. 2.

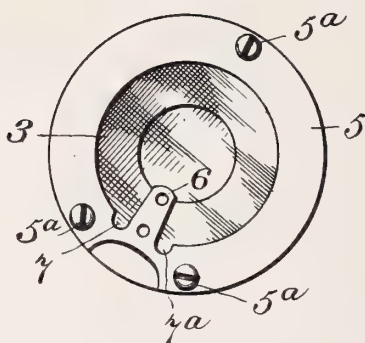


Fig. 3.

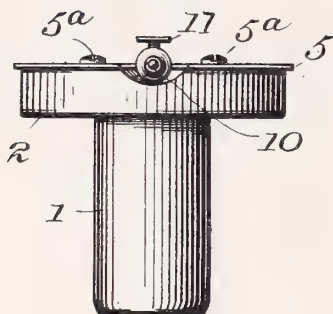


Fig. 4.

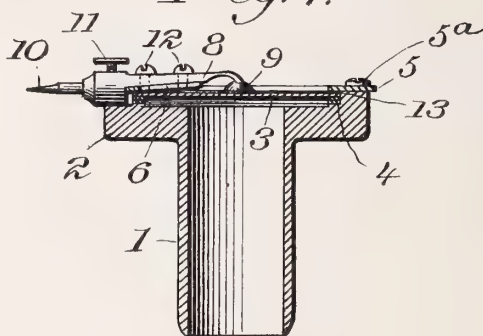
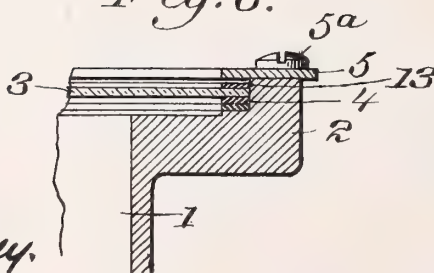


Fig. 5.



Fig. 6.



WITNESSES:

Emile M. Lam

W. H. Humphrey

INVENTOR

Louis P. Valiquet

BY

A. Parker Smith

ATTORNEY

UNITED STATES PATENT OFFICE.

LOUIS P. VALIQUET, OF NEW YORK, N. Y., ASSIGNOR TO THE UNIVERSAL TALKING MACHINE COMPANY, OF SAME PLACE.

SOUND-REPRODUCER.

SPECIFICATION forming part of Letters Patent No. 679,923, dated August 6, 1901.

Application filed December 19, 1898. Serial No. 699,636. (No model.)

To all whom it may concern:

Be it known that I, LOUIS P. VALIQUET, a citizen of the United States of America, and a resident of New York city, county of New York, State of New York, have invented certain new and useful Improvements in Sound-Reproducers, of which the following is a specification.

My invention relates to talking-machines; and it consists of an improved form of sound-box and means for mounting the diaphragm and reproducing-stylus thereon.

My invention is applicable to any form of talking-machines, but specifically designed to be employed on what is known as the "gramophone."

The preferred form of apparatus embodying my invention is illustrated in the accompanying sheet of drawings, in which—

Figure 1 is an end elevation of a sound-reproducer as a whole. Fig. 2 is a similar view with the stylus-carrier and stylus removed. Fig. 3 is a side elevation of the reproducer. Fig. 4 is a central section on the line 4 4 of Fig. 1. Fig. 5 is a detail of the stylus-carrier and stylus; and Fig. 6 is an enlarged detail of a portion of Fig. 4, showing the diaphragm-mounting more clearly.

Throughout the drawings like reference-figures refer to like parts.

The reproducer is composed of the ordinary form of sound-box, having a cylindrical or tubular portion 1 and a flanged portion 2. In the flanged portion, recessed for the purpose, is the diaphragm 3, which may be of mica or any other suitable substance. I have illustrated it as of mica or other transparent material. A retaining-ring 5 is fastened to the face of the flanged portion 2 of the sound-box by a series of screws 5^a or other suitable means, said ring acting to retain the diaphragm in position. There is a gasket of rubber 4 or other non-sonorous material between the sound-box and the diaphragm. The retaining-ring 5 has an extension 6 projecting toward the center. Preferably this extension should be of some resilient material, such as steel, and preferably the entire retaining-ring and extension is stamped out of one piece of steel or iron. The ring 5 is cut away at the base of the extension 6, as shown at 7

7^a, &c., so as to leave a reduced quantity of metal, forming the base of said extension 6. On this extension 6 is mounted the stylus-carrier 8 by means of the screws 12 12 or otherwise. This stylus-carrier is phonetically connected to the diaphragm by having its inner end pressed against said diaphragm normally or by having a deposit 9 of shellac or other material upon the diaphragm and in which the end of the stylus-carrier is embedded, as shown in Figs. 1 and 4. The outer end of the stylus-carrier has a socket in which the stylus-needle 10 is mounted and retained by means of the set-screw 11 or other clamping device. The diaphragm 3 and gasket 4 are made of such thickness that they do not quite fill the space left under the retaining-ring 5, and in this open space I insert a loose gasket 13, of paper or other non-sonorous material.

The method of operation of my invention is evident from the foregoing description. The parts being assembled, as shown in Figs. 1, 3, and 4, and the sound-box mounted in a proper reproducing-machine and the stylus 10 inserted in the groove of the sound-record vibrations are given to said stylus 10, which are transmitted to the stylus-carrier 8 and through the phonetic connection to the diaphragm 3. The diaphragm being caused to vibrate sets up sound-waves, which are carried away through the tube-shaped portion 1 of the sound-box.

The advantages of the invention are as follows: The spring extension 6 of the retaining-ring 5 being made integral therewith reduces the number of parts by one. Moreover, the spring extension has no curve or sharp bend in it, as is the case with some other mountings for the stylus-carrier, which are liable to break at the bend. The whole retaining-ring serving as a base for the spring-mounting for the reproducing-stylus has a large bearing area on the sound-box and furnishes a particularly rigid and firm support. The cut-away portions 7 and 7^a at the base of the spring extension 6 can be filed down after the reproducer parts have been assembled and tried until the exact degree of elasticity is given to the stylus-mounting which produces the best results. It is a fact, of course, that every individual stylus-mount-

ing has its individual amount of elasticity, which may or may not be that calculated to produce just that degree or rate of vibration which will give the best result in combination with any given sound-box. It is evidently impossible to determine in advance just what the degree of elasticity will or should be in any particular stylus-mounting until after it has been attached to the sound-box and tested. My invention provides an easy and convenient means of modifying this elasticity after the reproducer parts have been all assembled. Frequent tests are consequently possible to determine when the correct degree of modification to produce the best results has been obtained. The loose gasket 13 is also of great importance in suppressing certain independent vibrations of the diaphragm and parts, which would otherwise occur, and thus confines the diaphragm to its proper work of faithfully reproducing the impressed vibrations received from the sound-record. In ordinary reproducers scratching and buzzing sounds are noticeable, which I believe to be the result of these independent vibrations of the diaphragm and connected parts; but whether this be the correct theory or not I have discovered that the simple insertion of a loose paper gasket 13 in the position shown removes these foreign sounds. The gasket 13 should not be clamped between the diaphragm and the retaining-ring, but should lie there loosely.

It is evident, of course, that various changes could be made in the details of the apparatus described without departing from the scope of my invention, so long as the general arrangement of parts shown in the drawings and principle of operation described in the specification are preserved. Other forms of

sound-box might be employed, the retaining-ring and extension thereof might be given a different shape, other methods of attaching the stylus to the said extension might be employed, &c.; but all these I regard as changes in the form and not in substance and as being still within the scope of my invention.

Having, therefore, described my invention, what I claim as new, and desire to protect by Letters Patent, is—

1. In a sound-reproducer the combination of the sound-box, the diaphragm therein, the retaining-ring therefor which has a spring extension formed integral therewith, and the reproducing-stylus mounted on said spring extension, and phonetically connected to the diaphragm, substantially as described.

2. In a sound-reproducer the combination of the sound-box, the diaphragm therein, the retaining-ring therefor which has a spring extension, said retaining-ring being partly cut away at the base of the spring extension, and the reproducing-stylus mounted on said spring extension, and phonetically connected to the diaphragm, substantially as described.

3. In a sound-reproducer the combination of the sound-box, the diaphragm therein, the retaining-ring therefor, the stylus-carrier mounted on an integral projection of said ring, and having one end bearing on the diaphragm, and the stylus mounted in said carrier, substantially as described.

Signed by me at New York city, county and State of New York, this 17th day of December, 1898.

LOUIS P. VALIQUET.

Witnesses:

LILIAN FOSTER,
A. PARKER SMITH.

90.329

No. 680,339.

Patented Aug. 13, 1901.

T. H. MACDONALD.
GRAPHOPHONE.

(Application filed Nov. 22, 1907.)

(No Model.)

2 Sheets—Sheet 1.

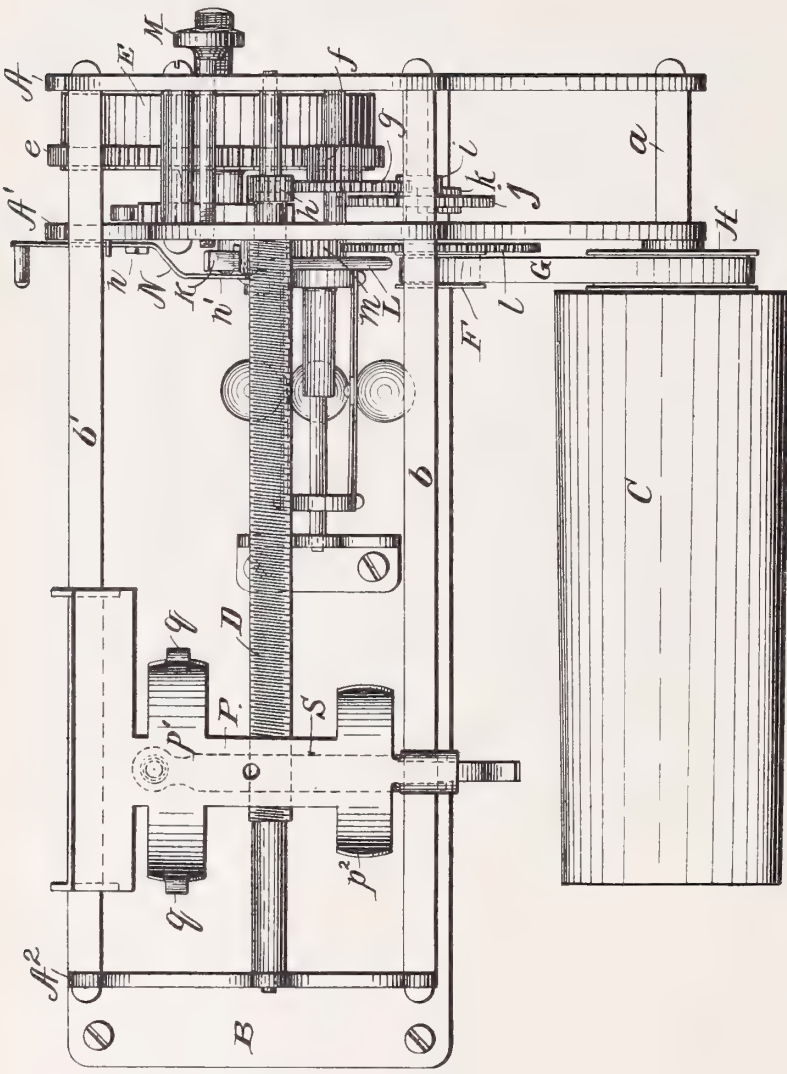


Fig. 1.

Witnesses.
W. R. Edelen.
New York

Inventor.
Thomas H. Macdonald.
by J. H. Macdonald,
his attorney.

No. 680,339.

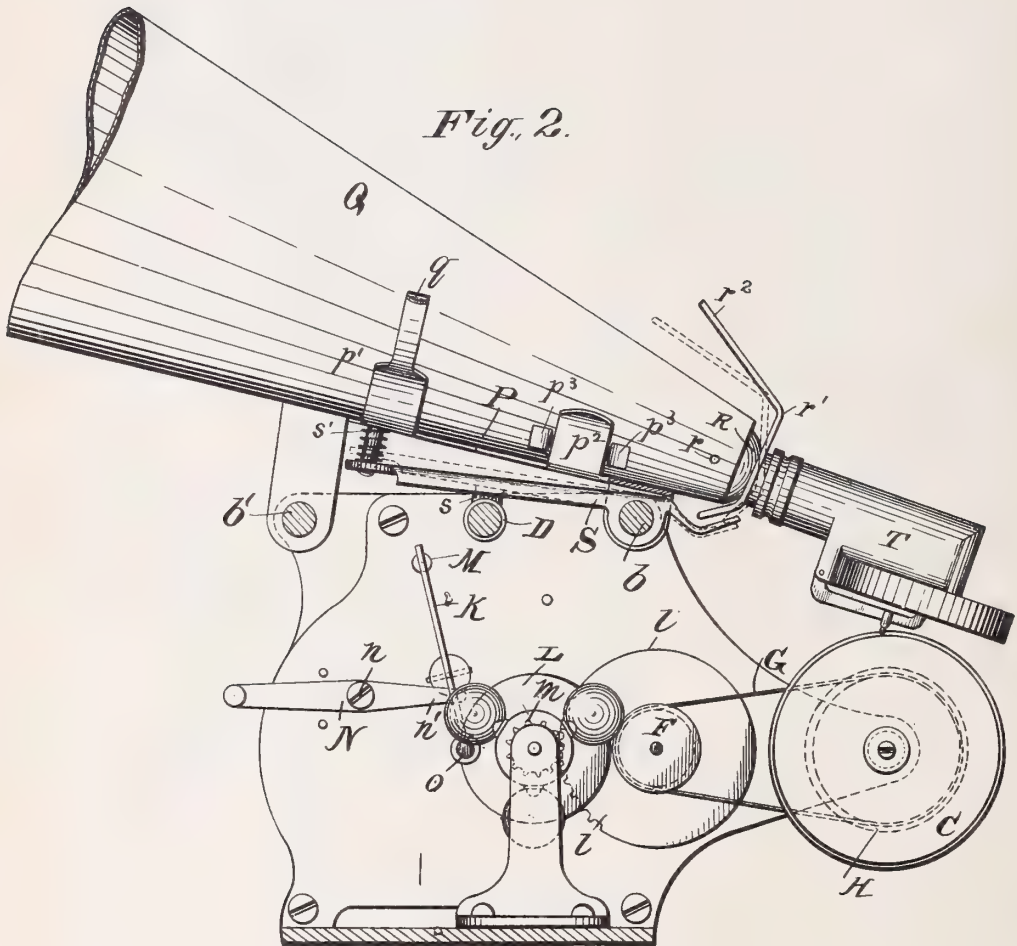
T. H. MACDONALD.
GRAPHOPHONE.

(Application filed Nov. 22, 1897.)

Patented Aug. 13, 1901.

(No Model.)

2 Sheets—Sheet 2.



Witnesses.
H. R. Edelin.
Jesse Lewis.

Inventor.
Thomas H. Macdonald,
by Solomon M. Munn,
his attorney.

UNITED STATES PATENT OFFICE.

THOMAS H. MACDONALD, OF BRIDGEPORT, CONNECTICUT, ASSIGNOR TO
THE AMERICAN GRAPHOPHONE COMPANY, OF WEST VIRGINIA.

GRAPHOPHONE.

SPECIFICATION forming part of Letters Patent No. 680,339, dated August 13, 1901.

Application filed November 22, 1897. Serial No. 659,407. (No model.)

To all whom it may concern:

Be it known that I, THOMAS H. MACDONALD, of Bridgeport, Connecticut, have invented new and useful Improvements in Graphophones, which improvements are fully set forth in the following specification.

The object of the present invention is to produce a graphophone which while capable of giving results as good as formerly in the reproduction of musical and other sound records shall yet be light, small, compact, and of economical construction. To that end I have devised certain improvements in the arrangements of the motor, feed mechanism, reproducer-carriage, and other parts which can be most conveniently explained in connection with the accompanying drawings, in which—

Figure 1 is a plan view of a graphophone and its driving mechanism constructed in accordance with my invention. Fig. 2 is a vertical cross-section and side elevation.

The frame of the machine consists, mainly, of three upright plates A A' A^2 , all mounted on bed-plate B . Plates A A' have forward projections, between which is a tube a , which constitutes a long bearing for the mandrel-shaft, the mandrel C being unsupported at its other end. These plates also constitute the bearings for the spindles of the spring-motor, whose gears are between said plates. The three plates are held together at the top by a front tie-rod b and a rear tie-rod b' , which rods also constitute the guides or ways upon which the reproducer-carriage slides, as will be hereinafter described. About midway between these two rods is the feed-screw D , which is journaled in the end plates A A^2 and passes loosely through the intermediate plate A' .

E represents the barrel of the spring-motor. It carries a large gear e , which drives a pinion f . On the same shaft with the latter is a spur-gear g , which drives a pinion h on the feed-screw shaft. Motion is communicated from gear g to the mandrel C through pinion i , gear j , and pinion k to the shaft of the latter, which passes through plate A' and carries on the opposite side thereof a spur-gear l and a pulley F . The latter is connected by a belt G with a larger pulley H on the mandrel-shaft. Gear l engages a pinion

m on the rotating sleeve of the friction-governor, which is preferably of the type described in my Patent No. 587,265, dated July 27, 1897.

For operating the centrifugal governor as a brake, and also a speed-regulator for varying speeds, a lever K is pivoted on a projection of plate A' and carries at one end a leather stud o , adapted to make contact with the rotatory friction-disk L . The outer face of this lever K is inclined somewhat outwardly away from the plate A' , providing a slight cam-surface. An adjusting-screw M determines the normal position of the lever. An arm N , pivoted at n to plate A' and whose rear projection n' bears on lever K , serves in one position to press stud o forcibly against disk L by means of the cam-surface on lever K , and so arrest the motor, and in the other position to throw lever K into contact with adjusting-screw M .

P represents the carriage for the sound reproducer or recorder T , mounted to slide on the tie-rods b b' . It has a saddle formed of two curved plates p' p^2 , in which rests a horn Q , attached thereto by prolongations of one of these plates, as p' , which constitute spring-clips q q , or by other suitable attaching or clamping means. Lugs p^3 on horn Q engage plate p^2 and keep the horn from slipping. The hollow socket R , to which the recorder or reproducer is connected in the well-known way, is pivoted by pin r directly in the small end of the horn. Beneath carriage P and pivoted on rod b is a lever S , carrying a section of a nut s , which normally engages feed-screw D , being pressed into engagement therewith by a light helical spring s' . Socket R has a bent metal plate r' , the lower end of which is just above the end of lever S , the upper end r^2 constituting a finger-piece. By pressing on this finger-piece socket R is tilted on its pivot, thus raising the recorder (or reproducer) from the tablet, and by the same movement plate r' depresses the end of lever S , thus lifting the nut s from engagement with the feed-screw.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a graphophone the combination of a

base, two upright plates secured thereto, a motor-spring between said plates and having its shaft journaled in said plates, a feed-screw journaled in one of said plates and in a third plate, a carriage actuated by said screw, a sound-conveyer supported by said carriage but removable therefrom, a recorder or reproducer supported by said sound-conveyer, a suitable gearing between the motor-shaft and the mandrel-shaft and between the motor-shaft and the feed-screw, substantially as described.

2. In a graphophone, the combination of a mandrel or tablet support, of a carriage, means for giving said carriage translatable motion relative to the tablet, a sound-conveyer supported on but removable from said carriage and a recorder or reproducer supported by said conveyer, substantially as described.

3. The combination of a carriage and means for moving the same with a horn supported by said carriage and a recorder or reproducer supported by said horn.

4. The combination of a horn and means for supporting the same, with a recorder or reproducer supported by said horn.

5. The combination of a horn and means for supporting the same, with a recorder or reproducer loosely mounted in and supported by the small end of the horn.

6. In a graphophone the combination with the feed-screw, of a carriage, a horn supported thereby, and a hollow socket for attachment of the recorder or reproducer supported in the small end of said horn, substantially as described.

7. The combination with the feed-screw, of a sliding carriage adapted to be driven by said feed-screw, a horn supported by said carriage, and a hollow socket swiveled in the small end of said horn and provided with means for attachment of a recorder or reproducer, substantially as described.

8. The combination with the carriage, and means for moving the same, of a saddle on said carriage, a horn provided at its small end with a socket attachment for the recorder or

reproducer, and means for attaching said horn to said saddle, substantially as described.

9. The combination with the feed-screw, of the carriage, the horn supported thereby, the nut for engagement with said screw movably supported by said carriage, the socket swiveled in the end of said horn, and connections between the socket and nut, whereby the tilting of the former moves the latter into or out of engagement with the feed-screw, substantially as described.

10. The combination with the feed-screw, of the carriage, the horn supported thereby, the nut for engaging said screw, a lever pivoted on said carriage and connected with said nut the socket swiveled in the end of said horn, and a plate on said socket engaging said lever, substantially as described.

11. In a talking-machine, the combination with a motor and its train of gears supported by and between two bearing-plates, of a feed-screw that propels the carriage for a recorder or reproducer, a governor located below the said feed-screw, and a mandrel supported at one end from said bearing-plates and located in front of said feed-screw and governor, the said feed-screw, governor, and mandrel being so arranged relative to each other and to the driving-gears, that motion is imparted to each of them from opposite sides of a common driving-gear.

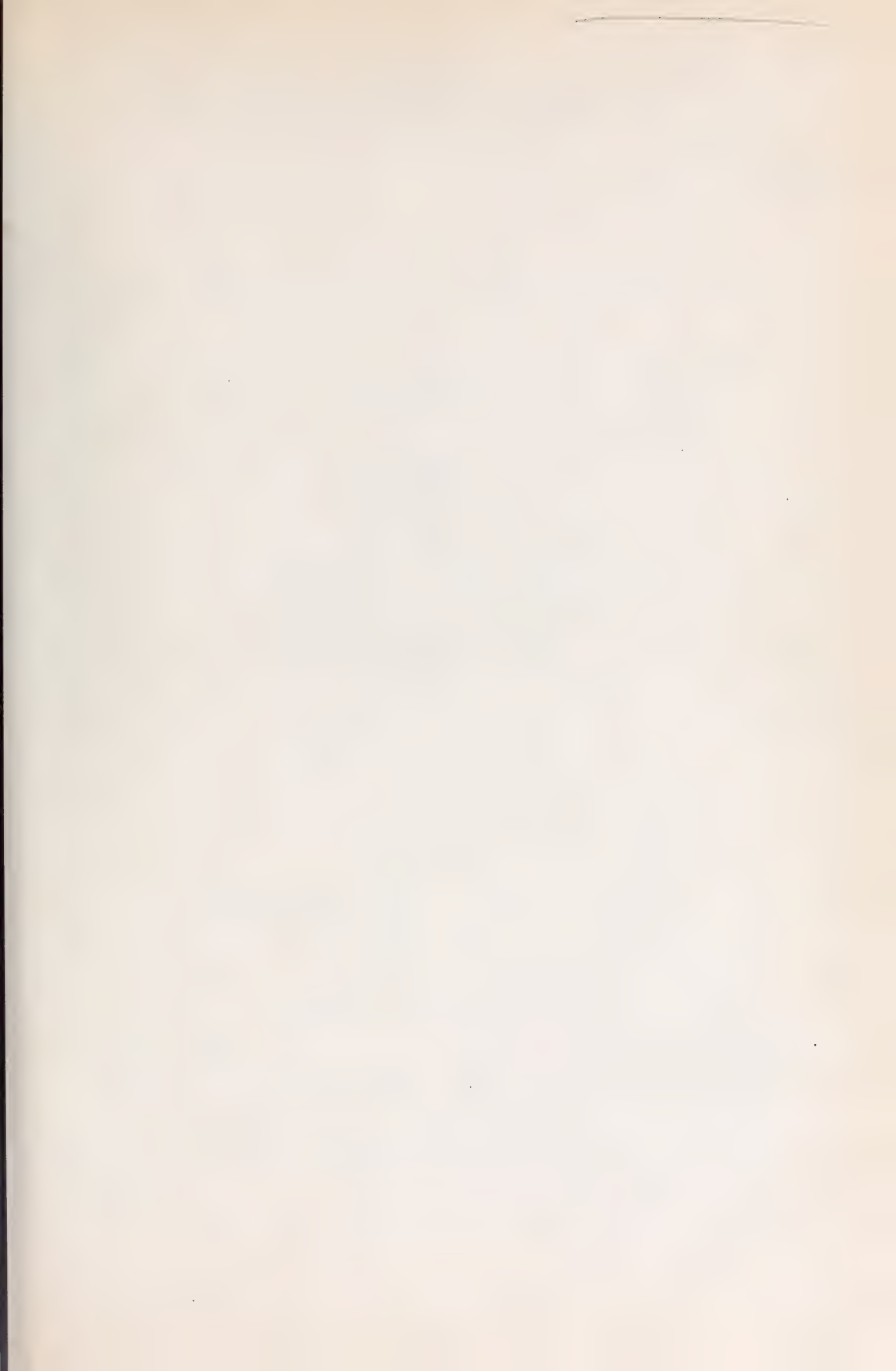
12. In a talking-machine, the combination of a recorder or reproducer supported by a sound-conveyer, said sound-conveyer being both supported and moved longitudinally by a carriage, and said carriage in combination with a mandrel and means for revolving said mandrel while moving said carriage longitudinally, substantially as described.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

THOMAS H. MACDONALD.

Witnesses:

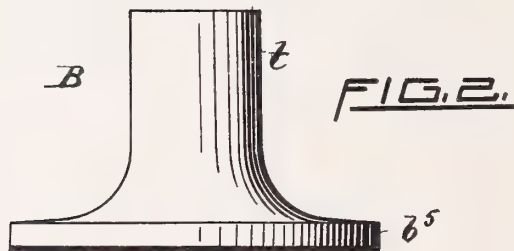
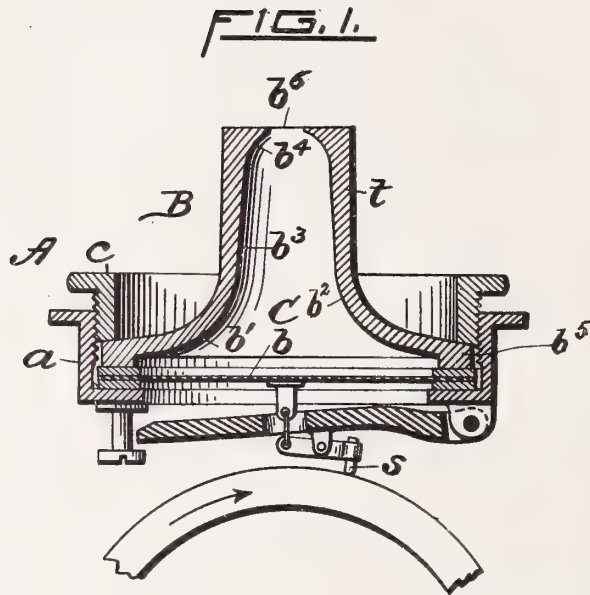
WM. IRELAND STAN,
A. B. KEOUGH.



W. R. DUTEMPLE.
DIAPHRAGM TUBE PLATE FOR PHONOGRAPHS.

(Application filed Oct. 12, 1900.)

(No Model.)



WITNESSES.

INVENTOR.

Charles T. Hannigan

William R. Dutemple

William A. Sullivan

By Geo. H. Remington & Co.

Attys.

UNITED STATES PATENT OFFICE.

WILLIAM R. DUTEMPLE, OF AUBURN, RHODE ISLAND.

DIAPHRAGM TUBE-PLATE FOR PHONOGRAPHS.

SPECIFICATION forming part of Letters Patent No. 680,431, dated August 13, 1901.

Application filed October 12, 1900. Serial No. 32,841. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM R. DUTEMPLE, a citizen of the United States of America, and a resident of Auburn, in the county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Diaphragm Tube-Plates for Phonographs, of which the following is a specification.

My invention relates to improvements in phonographs, and more especially to the diaphragm tube-plates of the sound-boxes of such sound recording and reproducing machines; and it consists, essentially, of a chambered diaphragm tube-plate or initial sound-receiving member having its lower end enlarged and adapted when in use to be removably mounted above the diaphragm seated in the frame or housing of a sound box or reproducer and having a contracted or reduced diaphragm-chamber, made by forming the base of the tube-plate with convex interiorly-curved walls which merge into a central tapered shank, which terminates by a concave surface into a reduced central opening, the inner periphery of the opening having thin and sharp edges, whereby the sound-waves are first condensed and then contracted before expanding into the open air or projector, all as will be more fully hereinafter set forth and claimed.

In the construction of sound-boxes of the class above referred to it has been usual heretofore, so far as I am aware, to make the base portion of the tube-plates practically flat, the diaphragm-chamber in such case being comparatively shallow, while at the same time the bore of the tubular portion is substantially cylindrical or having divergent sides in direct communication with and forming a part of the diaphragm-chamber. In another case the base portion of the diaphragm tube-plate has a convex or dome-shaped diaphragm-chamber, this too being in direct communication with the straight or cylindrical bore of the central tubular part. In these as well as in other sound-boxes the diameter of the opening or bore at the mouth or upper end of the tubular portion of the tube-plate is substantially the same or larger than at the point where the bore intersects the lower or

enlarged portion of the diaphragm-chamber. There are objections or disadvantages inherent in sound-reproducing machines provided with diaphragm tube-plates having diaphragm-chambers constructed substantially as above described even when the machine is fitted with any of the well-known devices through which the diaphragm is vibrated by means of a stylus in engagement with the grooved path or track formed in the traveling record. In such former sound-boxes the sound-waves are first collected in the diaphragm-chambers thereof. Said waves upon being discharged or projected therefrom possess to a considerable degree what may be termed a "metallic" sound, or, in other words, this metallic tone in the sound-waves is due largely, I believe, to the imperfect form of the diaphragm-chamber, in that the latter does not permit the sound-waves to become sufficiently contracted or condensed, as it were, before they are discharged into the outer air. I have discovered and demonstrated by experiments that by providing the bore of the outer or upper end of the tube-plate or diaphragm-chamber member with a contracted opening equal, say, to at least one-half the diameter of the normal bore the sound-waves thus reproduced and issuing from the diaphragm-chamber possess greater strength and intensity, while being less metallic the tone is purer and the enunciation is clearer and more distinct, while the volume of sound is as great and as far-reaching as compared with diaphragm-chambers or diaphragm tube-plates as usually constructed.

In the accompanying drawings, Figure 1 is a transverse central sectional view, enlarged, of a sound-box or sound-reproducer provided with a diaphragm tube-plate embodying my improvements; and Fig. 2 is a side elevation of the tube-plate member detached from the sound-box.

In the drawings, A indicates a sound-box of well-known construction, the same comprising the frame or housing member *a*, the diaphragm *b*, seated therein, an annular follower *c*, screwed into the frame, whereby the diaphragm is kept firmly in position, and mechanism or levers for carrying the movable

stylus *s*, a portion of said mechanism being rigidly secured to the under side of the diaphragm *b* at its center.

The chambered diaphragm tube-plate B forming the subject of my present invention has its lower portion *b'* flaring outwardly and provided with an outer rim or flange *b⁵*, whereby the tube-plate and diaphragm are adapted to be firmly clamped in position in the said frame *a* and above the diaphragm by means of the follower-nut *c*, as usual. The upper or tubular portion *t* of the member B is substantially cylindrical exteriorly and adapted to receive thereon the small end of a cone-shaped "horn," also as usual. The diaphragm-chamber C of the said member B, I prefer to make substantially as represented, the same having the upper surface of its lower or base portion slightly beveled and extending upwardly in a gradually-decreasing diameter having convex sides *b²*. From this point upwardly the interior of the said tubular part *t* is provided with a tapered bore *b³* in direct communication with and forming a part of the diaphragm-chamber. The upper end *b⁴* of the bored portion is spherical or concave and terminates in the comparatively small central opening *b⁶*. I prefer to true off the face of the upper end of the tubular shank or neck *t*, thus making the axis of said opening *b⁶* at right angles therewith, the construction being such that the intersection of the upper end portion *b⁴* of the bore and the said opening forms a practically sharp or thin edge, all as clearly shown.

In a diaphragm tube-plate provided with a diaphragm-chamber C embodying my invention the sound-waves produced by the vibrations of the diaphragm *b* are first collected in the lower part of the chamber, the curved sides *b²* acting to greatly condense the waves and reflect them toward the center of the chamber and are still further condensed in passing upwardly along the tapering bored part *b³* until they are suddenly reflected and contracted by striking against the concave surface *b⁴*. The thus condensed waves now in flowing out of or being discharged from the tube-plate impinge against the sharp edge of

the small or contracted opening *b⁶* and quickly expand into the outer air or projector, if one be used.

I do not claim, broadly, as my invention an apertured diaphragm tube-plate provided interiorly with a sound-collecting chamber having an enlarged base; but

What I do claim, and desire to secure by United States Letters Patent, is—

1. In a sound box or reproducer for phonographs or other analogous sound-reproducing machines, the combination with a suitably-mounted diaphragm and stylus-carrying mechanism in engagement with said diaphragm, of a diaphragm tube-plate located above the diaphragm, and having a contracted or reduced diaphragm-chamber made by forming the base of the tube-plate with convex interior-curved walls which merge into a central taper-bored shank which terminates by a concave surface into a reduced central opening, the inner periphery of the opening having thin and sharp edges, whereby the sound-waves are first condensed and then contracted before expanding into the open air or projector, substantially as described and for the purpose set forth.

2. In a device of the class described, the combination of a housing member having a diaphragm mounted therein and stylus-carrying mechanism in engagement with said diaphragm, of a diaphragm tube-plate mounted above the diaphragm, an annular follower-nut adapted to engage the interior of the housing member and clamp the tube-plate to the diaphragm; said tube-plate having a contracted chamber whose base is provided with an interior convex surface which merges into a central taper-bored shank and then terminates in a spherical or concave upper portion, through which a small central opening is formed having thin and sharp edges, substantially as described.

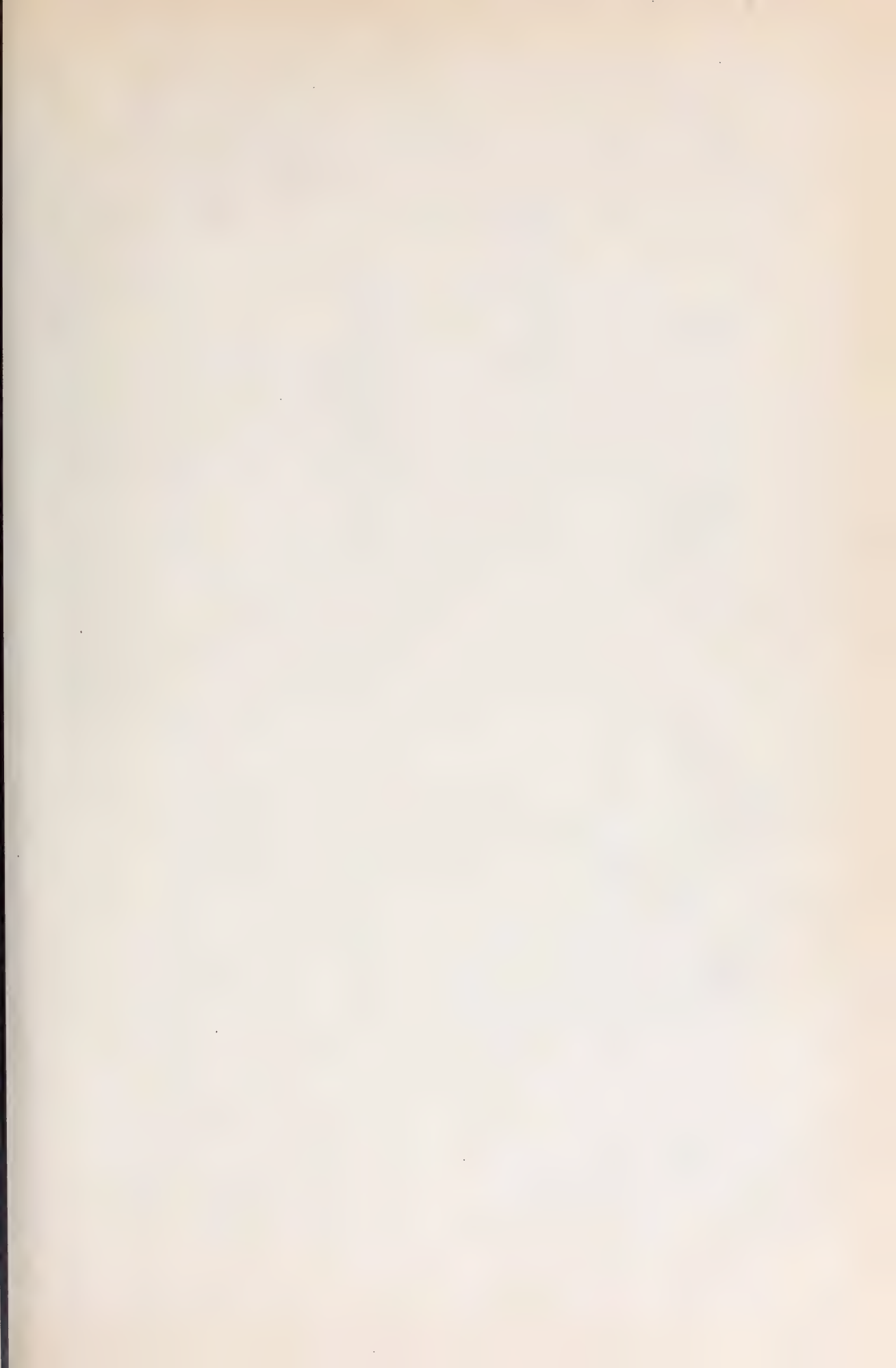
Signed by me at Providence, Rhode Island, this 11th day of October, A. D. 1900.

WILLIAM R. DUTEMPLE.

Witnesses:

GEO. H. REMINGTON,

WILLIAM A. SULLIVAN.



No. 680,520.

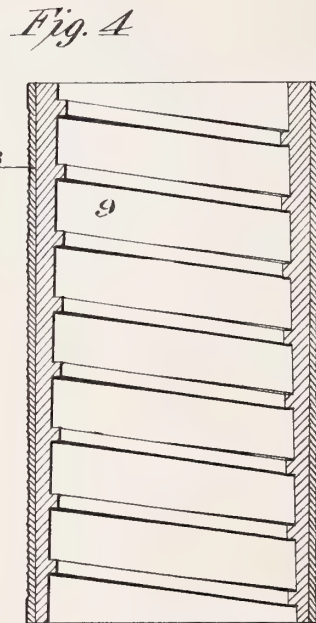
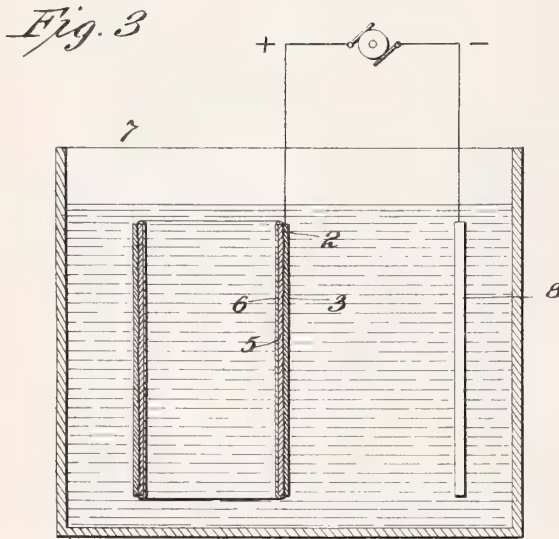
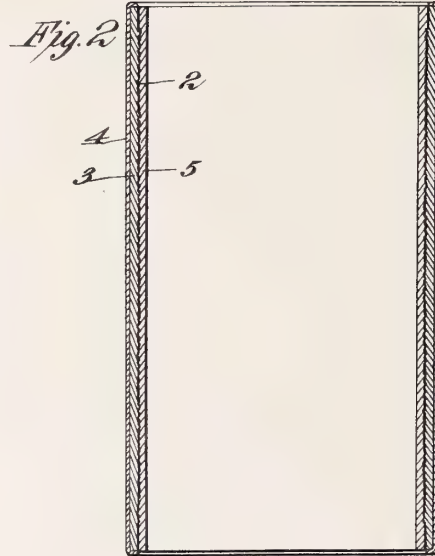
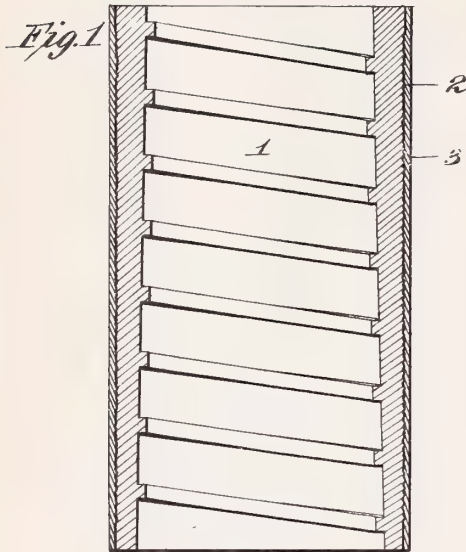
Patented Aug. 13, 1901.

T. A. EDISON.

PROCESS OF MAKING METALLIC DUPLICATE PHONOGRAPH RECORDS.

(Application filed Aug. 18, 1900.)

(No Model.)



Witnesses:

Jan. F. Coleman
Geo. A. Taylor

Inventor

Thomas A. Edison
by *Hyman Edmunds*
Att'ys.

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

PROCESS OF MAKING METALLIC DUPLICATE PHONOGRAPH-RECORDS.

SPECIFICATION forming part of Letters Patent No. 680,520, dated August 13, 1901.

Application filed August 18, 1900. Serial No. 27,237. (No specimens.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, a citizen of the United States, residing at Llewellyn Park, in the county of Essex and State of New Jersey, have invented a certain new and useful Process of Making Metallic Duplicate Phonograph-Records, (Case No. 1,042,) of which the following is a specification.

My invention relates to an improved process of making metallic copies of phonograph-records.

In Letters Patent No. 657,527, dated September 11, 1900, I describe a process of making metallic copies of phonograph-records consisting generally in first obtaining a matrix or mold of the original record; in then plating a metal upon the record-surface of said matrix, and in finally separating the matrix from the deposited metal, whereby the latter deposit will carry upon its exterior an absolutely-faithful copy of the original record. In said application I describe as a specific embodiment of the process the making of a matrix of copper, the coating of the record-surface thereof with a silver deposit, and the dissolution of the copper matrix by immersion in a hydrochloric-acid bath, which does not affect the silver.

My present invention relates to a specific improvement in a process of this type, wherein I am enabled to employ the same metal both for the matrix and for the copy to be secured therefrom, whereby the process may be somewhat facilitated and cheapened.

In order that my process may be better understood, attention is directed to the accompanying drawings, forming a part of this specification, and in which—

Figure 1 is a sectional view of an ordinary original phonographic cylinder, showing a thin film of metal preliminarily deposited thereon and a thicker coating electroplated upon such film to form a matrix; Fig. 2, a similar view of the matrix so secured separated from the original record, protected on its outer and end faces with a water-repellent material, and receiving on its record-surface a metal deposit; Fig. 3, a similar view illustrating the matrix with the deposited metal properly protected and immersed in a plating-bath to form the anode, and Fig. 4 a similar view of the finished metallic duplicate record.

In all of the above views corresponding parts are represented by the same numerals of reference.

1 represents a phonographic-record cylinder, which is usually made of a wax or wax-like composition, carrying the record on its exterior in the form of a shallow spiral groove. An original record to be duplicated having been first secured, the said record is coated on its exterior with a minutely-thin film 2 of metal, preferably gold, this film being applied to the record-cylinder by a process of vacuum deposit, as I describe in my Patent No. 526,147, dated September 18, 1894. Having coated the original record with the metallic film 2, a plating 3 is formed on said film by an electrodeposition process until said coating is of sufficient thickness to form the desired matrix. For ease of manipulation and economy of operation the coating 3 is preferably of copper. The record 1 is now removed from the matrix 3 in any suitable way—as, for instance, by shrinking the record by the application of cold or by heating the record, so as to melt the wax-like material thereof. Having thus removed the original record 1, a matrix will be secured carrying on its bore an absolutely-accurate negative copy of the original record, the record-surface of said matrix being obviously protected by the film 2 of gold or other metal different from that of the matrix. This matrix is then provided with a coating 4 (see Fig. 2) of stearin, paraffin, or other water-repellent material, and the matrix is immersed in a plating-bath and a coating 5 electrolytically deposited upon the record-surface of the matrix. This deposited coating 5 may be, and preferably is, of the same metal as the matrix 3—in the preferred instance of copper. It will be observed, however, that the deposit 5 will be separated from the matrix 3 by the intervening film of different metal 2. The protective coating 4 is now removed from the matrix and a corresponding coating 6 (see Fig. 3) is applied to the coating 5, so as to protect the same. The matrix carrying the deposited metal 5 is now immersed in a bath 7 and, as indicated diagrammatically, forms the anode of an electroplating-circuit, the solution in the bath being suitable for plating with the metal of which the matrix

is formed. The circuit through the bath being closed, the metal of the matrix 3 will be deposited upon a suitable cathode 8, whereby the matrix will be electrically dissolved and thereby freed from the deposited coating 5. When the film 2 is reached, which surrounds the deposited coating 5, no further deposit can take place. Having thus removed the matrix 3 from the deposited metal or coating 5, the latter is taken out of the bath, the protective coating 6 is removed therefrom, and a suitable lining or backing 9 of zinc, plaster-of-paris, type-metal, or other material capable of ready manipulation inserted in place therein, so as to form the complete metallic duplicate.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is as follows:

1. A process of making metallic duplicate records which consists in depositing a metallic film on an original phonograph-record, in depositing on said film a different metal to form a matrix, in removing the original record, in depositing upon said film a coating of the same metal as the matrix, and in finally removing the matrix from the deposited metal by an electrolytic action, substantially as set forth.

2. A process for making metallic duplicate records which consists in coating an original phonograph-record with a metallic film, in depositing a metal matrix on said film, in removing the record from the matrix so se-

cured, in depositing a metal on the film or record surface of the matrix, in protecting the last-mentioned metallic deposit, and in separating the matrix from the deposited metal by an electrolytic action, substantially as set forth.

3. A process of making metallic duplicate records which consists in depositing a metallic film on an original phonographic record, in depositing a different metal upon said film to form a matrix, in removing the record from said matrix, in depositing upon the film a coating of the same metal as the matrix, in protecting said deposited coating, and in dissolving the matrix electrolytically, substantially as set forth.

4. A process of making metallic duplicate records which consists in depositing a metallic film on an original record, in depositing a different metal on said film to form a matrix, in removing the original record from said matrix, in placing a protective coating on the matrix, in electrodepositing a metal upon the record-surface of the matrix, in removing the protective coating, in applying a protective coating to the metal deposited on the film, and in dissolving the matrix electrolytically, substantially as set forth.

This specification signed and witnessed this 23d day of July, 1900.

THOS. A. EDISON.

Witnesses:

J. F. RANDOLPH,

J. A. BOEHME.

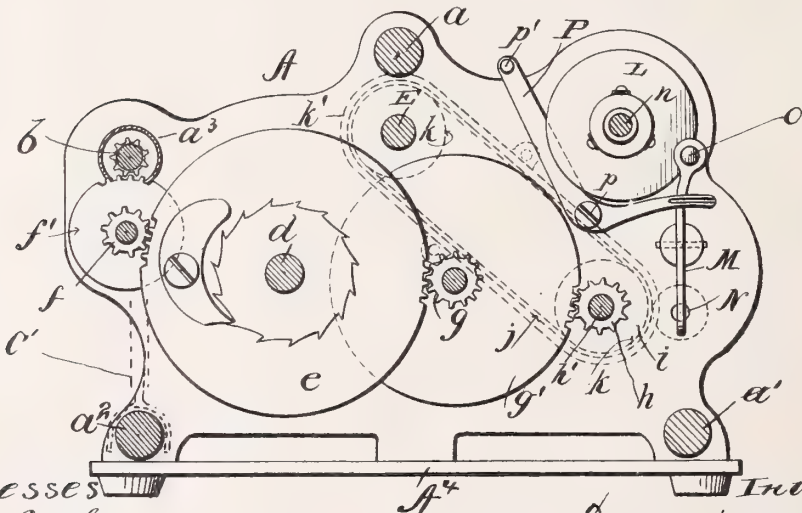
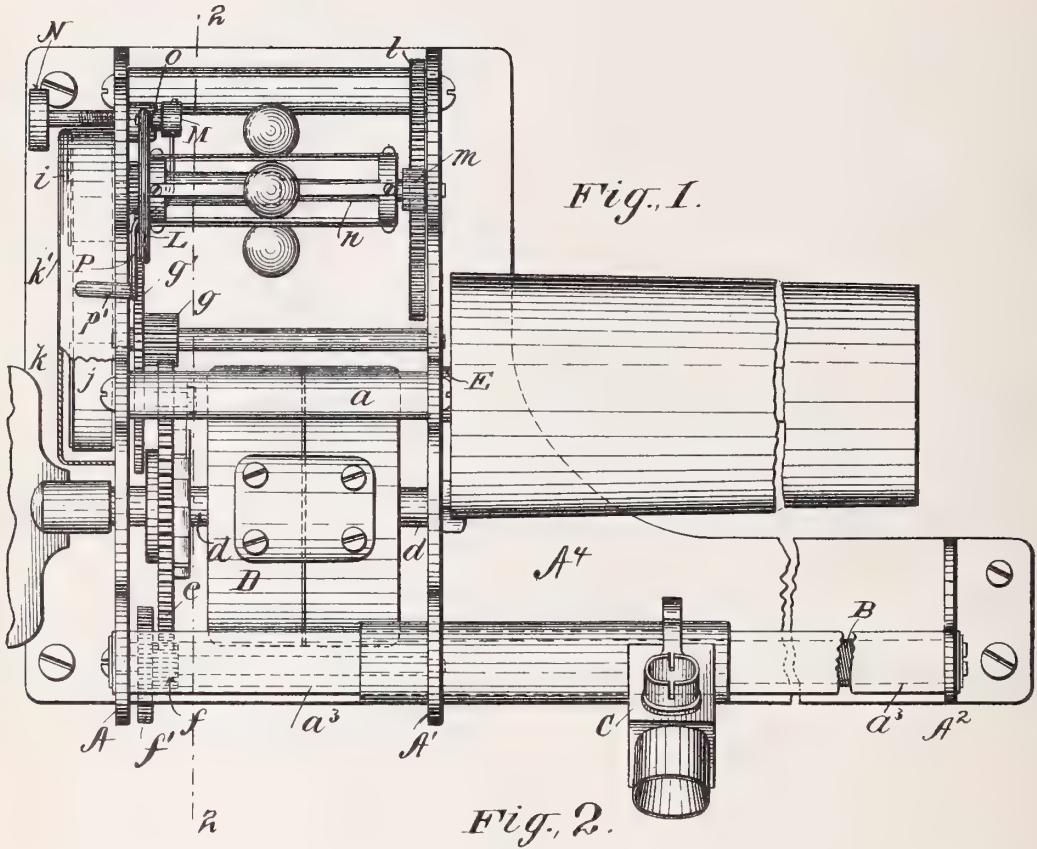
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No. 680,794.

Patented Aug. 20, 1901.

T. H. MACDONALD.
COMBINED GRAPHOPHONE AND MOTOR.
(Application filed Sept. 16, 1897.)

(No Model.)



Witnesses

W. R. Edsley

Reverend

Inventor.

Thomas A. Macdonald,
by J. J. McDonald,
his attorney.

UNITED STATES PATENT OFFICE.

THOMAS H. MACDONALD, OF BRIDGEPORT, CONNECTICUT, ASSIGNOR TO
THE AMERICAN GRAPHOPHONE COMPANY, OF WEST VIRGINIA.

COMBINED GRAPHOPHONE AND MOTOR.

SPECIFICATION forming part of Letters Patent No. 680,794, dated August 20, 1901.

Application filed September 16, 1897. Serial No. 651,912. (No model.)

To all whom it may concern:

Be it known that I, THOMAS H. MACDONALD, of Bridgeport, Connecticut, have invented new and useful Improvements in a Combined Graphophone and Motor, which improvements are fully set forth in the following specification.

This invention has reference to the construction of sound recording and reproducing apparatus generally known as "graphophones;" and its object is to simplify the construction of the mechanism (decreasing the cost, complexity, and liability to derangement) without sacrificing but, on the contrary, improving the quality of the acoustical results.

To this end I have designed new arrangements of the spring-motor mechanism and the parts of the graphophone (the mandrel and feed-screw) driven thereby, whereby greater compactness and rigidity are secured, the graphophone and motor in the improved construction constituting a single complete mechanism. I have also made improvements in the driving mechanism, as will be herein-after explained.

In the accompanying drawings, which form part of this specification, Figure 1 is a plan view of a combined graphophone and motor constructed in accordance with the invention. Fig. 2 is a vertical cross-section on line 2 2, Fig. 1.

The frame of the mechanism consists of three upright plates A A' A². The first two are of the same shape and extend the full width of the machine, the motor mechanism being supported between them. Plates A A' are rigidly connected together by a tie-rod *a* at the top of the plates and about the middle thereof, and tie-rods *a'* *a*² at opposite sides of the plates near the bottom thereof. Rod *a*² is prolonged and attached at its farther end to the bottom of plate A². The latter is also connected to plate A by a sleeve *a*³, which contains the feed-screw B and passes loosely through a hole in plate A'. Sleeve *a*³ constitutes the sliding way for the carriage C of the recorder or reproducer, and rod *a*² serves as a guide for the tailpiece C', which depends from the under side of the carriage, as in previous constructions. The lower ex-

tremity of said tailpiece is shown in dotted lines in Fig. 2. The whole frame thus constituted may be set on a bed-plate A⁴ or on any other suitable support. The mandrel-shaft E has its bearings in plates A A' and is located about midway between the ends of said plates or just beneath rod *a*. The arbors of the motor mechanism also have their bearings in plates A A'.

D represents the barrel of the mainspring, (preferably a tandem or duplex spring,) mounted on arbor *d*, on which is also mounted a spur-gear *e*. This gear through a pinion *f* and gear *f'* on the same arbor therewith drives pinion *b* on the shaft of the feed-screw. Through a separate train of gears comprising pinion *g*, spur-gear *g'* on the same arbor, and pinion *h* motion is communicated to arbor *h'*, which extends through plate A and has on its end a driving-pulley *i*. The latter through a belt *j* drives pulley *k* on the mandrel-shaft E. The belt and pulleys are preferably covered by a casing *k'*. Arbor *h'* also carries a spur-gear 1, Fig. 1, which drives a pinion *m* on the governor-shaft *n*. The governor is of the type described in my Patent No. 587,265, dated July 27, 1897.

Heretofore the mandrel-shaft has usually been connected by gearing to the feed-screw, so as to drive the latter, or the feed-screw and mandrel have been on the same shaft. The object of the improved construction is to make the mandrel independent of the feed-screw. By this construction, the feed-screw being driven by a train of gears and the mandrel by a belt from an independent train of gears, I am able to a large extent to prevent vibrations from the gearing and from the feed-screw being communicated to the mandrel and impairing the recording or reproduction of sounds.

For operating the centrifugal governor as a brake and also as a speed-regulator for varying speeds a lever M is pivoted on a projection of plate A and carries at one end a leather stud *o*, adapted to make contact with the rotatory friction-disk L of the governor. An adjusting-screw N determines the normal position of the lever, which in turn determines the speed of rotation of the motor. A bent arm P, pivoted at *p* to plate A, has its rear

end extending over and pressing upon lever M. Arm P can be turned on its pivot by means of a handle p' , so that the pressure of its rear end upon lever M will be shifted from one side of the pivot-point of said lever to the other, thereby tilting the lever in either direction to start the motor or to stop it by causing stud o to bear forcibly against disk L.

The carriage C for the recorder and reproducer is or may be similar in construction and operation to that heretofore used and requires no description.

Heretofore the graphophone and its motor (whether electric, spring, or treadle) were separate and distinct mechanisms, the former being simply connected with and driven from the latter by means of a belt. The principal departure in construction effected by the present invention is the consolidation of the two into one concrete mechanism or structure.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a graphophone the combination of a frame having two upright plates secured to a suitable base, a motor-spring having its shaft journaled in said plates, a mandrel-shaft having bearing at one end only where it is journaled in said plates said shaft projecting from and lying outside of the plates at its outer end, a feed-screw shaft separate from the mandrel-shaft journaled in the frame, and gearing connecting the spring-shaft with the mandrel-shaft and with the feed-screw shaft.

2. In a graphophone the combination of a frame consisting of upright plates rigidly secured together, of a motor-spring mounted on a shaft journaled in said plates, a mandrel-shaft journaled at one end only in said plates and at its other end projecting bodily therefrom, a mandrel on the projecting end of said shaft, a feed-screw shaft separate from the mandrel-shaft journaled in said plates, driving connections between the spring-shaft and the mandrel-shaft, and other driving connections between the spring-shaft and the feed-screw shaft.

3. The combination with the mandrel-shaft

and screw-shaft of a graphophone, of a motor, one line of connections from said motor for driving said mandrel, and separate connections for driving said feed-screw, substantially as described.

4. The combination with the mandrel-shaft and screw-shaft of a graphophone, of a spring-motor, connections between the main shaft of said motor and the mandrel, and separate connections from said main shaft to said screw-shaft, substantially as described.

5. The combination with the mandrel-shaft and screw-shaft journaled in suitable bearings, of a spring-motor, a belt and pulleys for driving said mandrel-shaft from one of the arbors of said motor, and separate driving connections between the main shaft of the motor and said screw-shaft, substantially as described.

6. The combination of a base with frame-plates secured thereto, a motor-spring between two of said plates and having its shaft journaled therein, a mandrel-shaft lying outside of said plates but having one end journaled therein, a screw-shaft journaled in said frame-plates, one line of connections from the spring-shaft to the mandrel-shaft and separate connections from the spring-shaft to the screw-shaft, substantially as described.

7. The combination with frame-plates secured to a suitable base, of a motor-spring between two of said plates and having its shaft journaled therein, a mandrel-shaft journaled in said plates but projecting bodily therefrom, a belt and pulleys through which motion is communicated from the spring-shaft to the mandrel-shaft, a screw-shaft also journaled in said frame-plates and separate driving connections between the spring-shaft and the screw-shaft, substantially as described.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

THOMAS H. MACDONALD.

Witnesses:

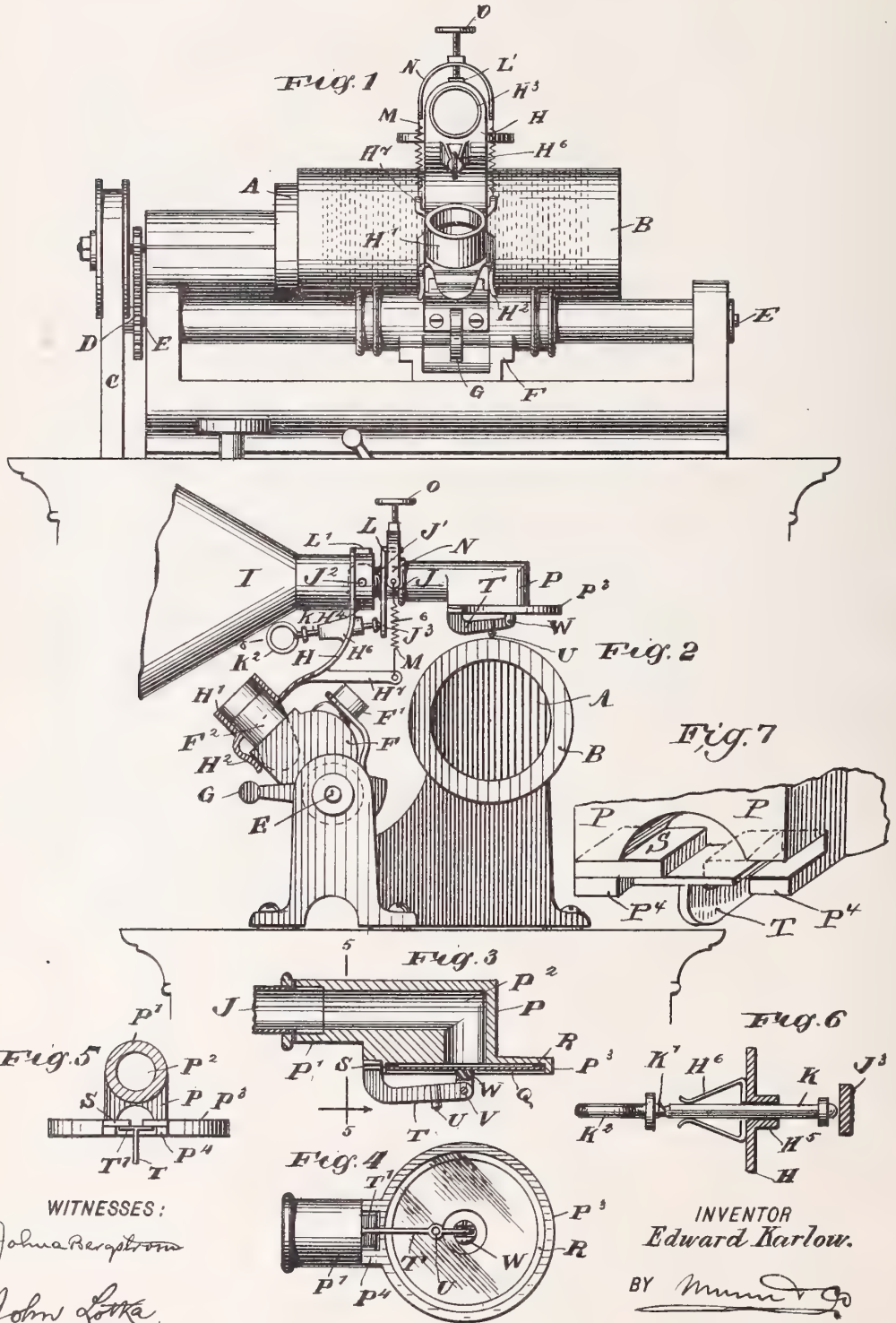
M. A. FOGO,

A. B. KEOUGH.

E. KARLOW.
PHONOGRAPH REPRODUCER.

(Application filed July 19, 1900.)

(No Model.)



WITNESSES:

John Bergstrom
John Latta

INVENTOR
Edward Karlow.

BY *Munn & Co.*

ATTORNEYS

UNITED STATES PATENT OFFICE.

EDWARD KARLOW, OF NEW YORK, N. Y., ASSIGNOR OF ONE-HALF TO
CHARLES F. SCHIPPELL, OF SAME PLACE.

PHONOGRAPH-REPRODUCER.

SPECIFICATION forming part of Letters Patent No. 681,058, dated August 20, 1901.

Application filed July 19, 1900. Serial No. 24,188. (No model.)

To all whom it may concern:

Be it known that I, EDWARD KARLOW, a citizen of the United States, and a resident of the city of New York, borough of Manhattan, county and State of New York, have invented a new and Improved Phonograph-Reproducer, of which the following is a full, clear, and exact description.

My invention relates to phonograph-reproducers, and has for its object to provide a device of this class in which the jarring and metallic sounds so troublesome in many reproducers will be eliminated and a clear loud tone obtained.

To this end my invention consists in a particular construction and arrangement of parts, as will be fully described hereinafter and particularly pointed out in the appended claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the figures.

Figure 1 is a front elevation of a phonograph or graphophone provided with my improved reproducer. Fig. 2 is an end view thereof. Fig. 3 is a central sectional side elevation of the reproducer drawn upon an enlarged scale. Fig. 4 is an inverted plan of the reproducer. Fig. 5 is a sectional elevation thereof on line 5 5 of Fig. 3. Fig. 6 is a sectional plan on line 6 6 of Fig. 2, and Fig. 7 is a detail perspective view of the support for the arm carrying the reproducing-point.

The phonograph or graphophone itself may be of any suitable construction. In the drawings I have shown the cylinder A holding the record B and driven by means of the belt C, while gearing D drives the usual feed-screw E, engaging the carrier F of the reproducer. I prefer to so construct my reproducer that it will fit the ordinary reproducer-carriers after removal of the reproducer, which presents no difficulty, since the reproducer is commonly removable from its carrier.

F' is the socket or tube which normally receives the ordinary reproducer, (but is without function in my invention,) and F² is the tube which is ordinarily connected with the horn or hearing-tubes.

G is the arm used in ordinary graphophones for throwing the reproducer upon and off the record and connecting the carrier operatively with the feed-screw or disconnecting it therefrom, all these parts being of the usual construction or at least they form no part of my present invention. The arm G, however, in my invention only serves to establish or interrupt the driving action of the feed-screw on the carrier.

My improvement comprises a support or frame H in the nature of a curved plate or bracket and having at its lower end a socket H' and lugs H², adapted to fit, respectively, upon the tube F² and upon the body of the carrier F, as shown in Figs. 1 and 2. In this manner the frame H is rigidly yet removably supported on the carrier F. At the upper end of the frame or support H is rigidly secured a tube H³, projecting rearwardly therefrom and adapted to receive the end of a horn, such as I. In alinement with the tube H³ another tube H⁴ projects from the support H, but forwardly, and to said tube H⁴ is pivoted about a horizontal axis J² a spherical portion J', located at the rear of a swinging tube J, which is adapted to carry the reproducer, as will be described presently. The swinging tube has an arm J³ extending downwardly therefrom and adapted to be engaged by a pin K, mounted to slide in a socket H⁵ of the support H and engaged by elastic friction-jaws H⁶, attached to the rear of said support. The pin has a groove K' at its rear end to hold it in the forward position when the jaws H⁶ engage said groove and an eye or handle K² for manipulating the pin. At the top of the swinging tube J is located a bearing-plate L, made of leather or light material, and a similar plate L' is provided at the top of the support H—for instance, upon the tube H⁴. From the support H projects forwardly a U-shaped arm H', having attached thereto the lower ends of springs M, the upper ends of which are secured to an arched bar or hoop N, having at its center a screw-threaded bearing for a screw O, the end of which is adapted to engage either of the bearing-plates L or L'.

The reproducer proper comprises a casing P, with a tube P', adapted to fit over the tube J of the support, and a sound-passage P².

The casing has a circular flange P³, forming a holder for the diaphragm Q, which is spaced from the casing at its edge by a rubber ring R. Adjacent to the tube P' the casing has two spaced lugs P⁴, recessed to receive the ends of two elastic plates S, preferably of soft rubber, the inner ends of which are slightly spaced from each other. To these plates is secured or cemented a plate or foot T', disposed at the end of the arm T, which carries the usual reproducing-point U. As the arm is cemented to the rubber plates S, it has only a very slight lateral mobility. The inner end of the arm T engages a pin V, connecting two spaced fork members W, projecting from the center of the diaphragm Q, as usual. The distance between these members is somewhat greater than ordinarily, so that the inner end of the arm T, which is free to slide transversely on the pin V, may not be jarred into engagement with the fork members. It will also be observed, Fig. 2, that the parts are so arranged that the reproducing-point U will be exactly on top of the record B.

The operation is substantially the usual one, the pin K being employed to hold the reproducer away from the record or lower it upon the same, while the arm G throws the carrier F into or out of operative connection with the feed-screw E. The sound is very strong as it passes from the diaphragm Q directly to the horn I, with only one bend or deflection in the passage P². As the arm T does not engage any metal at and is cemented to the rubber plates S, it cannot rattle at that point, while it is yieldingly mounted, so as to be capable of following the vibrations of the point U. The arm T cannot engage the members of the fork W either, as the plates S allow only a very slight lateral movement of the said arm.

Should any imperfect records produce screeching sounds, (owing to too strong vibrations of the reproducing-point U,) this can be remedied by placing the screw O upon the bearing-plate L, so as to press the reproducer more forcibly down upon the record by the tension of the springs M, which can be adjusted by turning the screw O. When not in use, the screw is placed on the bearing-plate L'.

While I have shown two separate plates S and while this arrangement is preferable on account of its greater elasticity, I might employ a single plate extending entirely across the space between the ears or lugs P⁴. Also instead of making the support H with the lugs H² and socket H' to fit ordinary carriers F, I may of course when constructing new machines make the support H in one with the carrier F, omitting the tubes F' and F². These and other changes may be made without departing from the nature of my invention.

I desire it to be understood that the term "phonograph" where it occurs in the claims is to be interpreted as meaning, broadly, a "talking-machine."

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. A phonograph-reproducer, provided with a diaphragm, an arm having one end loosely connected with the diaphragm and provided at its other end with a foot and between its ends with a reproducing-point, and a hinge connecting the foot of the arm with the body of the reproducer, said hinge consisting of rubber secured to oppositely-arranged supports and to which the foot of the arm is secured between the said supports, as set forth.

2. A phonograph-reproducer, provided with a diaphragm, an arm having one end loosely connected with the diaphragm and provided at its other end with a foot and between its ends with a reproducing-point, and two elastic plates secured to oppositely-arranged supports carried by the body of the reproducer, said plates extending inwardly toward each other from their supports and to which the foot of the arm is secured between said supports, as and for the purpose set forth.

3. The combination of a phonograph-reproducer, a support to which said reproducer is pivoted, a spring one end of which is attached to the support, a bar to which the other end of the spring is secured, and a screw passing through said bar and arranged to engage the pivoted reproducer.

4. The combination of a phonograph-reproducer, a support to which said reproducer is pivoted, springs each having one end attached to the support, an arched bar or hoop to the ends of which are secured the other ends of the springs, and a screw passing through the central portion of said hoop and arranged to engage the reproducer.

5. A phonograph attachment, provided with a support having an attaching-socket, a reproducer pivotally connected with said support, and a holding device movably secured to the support, and arranged to keep the reproducer in a raised position.

6. A phonograph attachment, provided with a support having an attaching-socket and lugs arranged adjacent to said socket, and a reproducer carried by the said support on the side opposite to that on which the lugs are arranged.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

EDWARD KARLOW.

Witnesses:

F. W. HANAFORD,
EVERARD BOLTON MARSHALL.

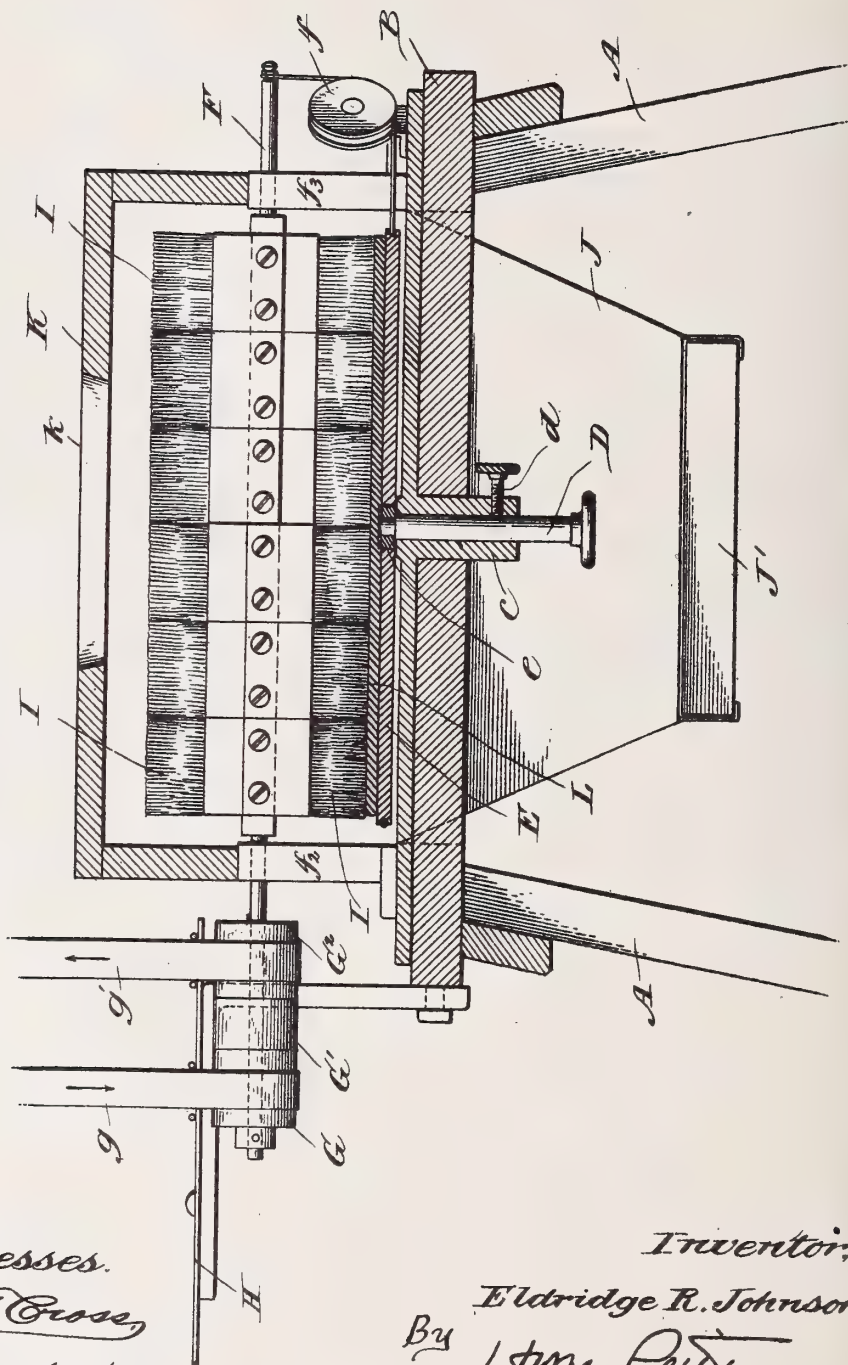
E. R. JOHNSON.
MACHINE FOR LEADING SOUND RECORDS.

(Application filed Jan. 20, 1900.)

(No Model.)

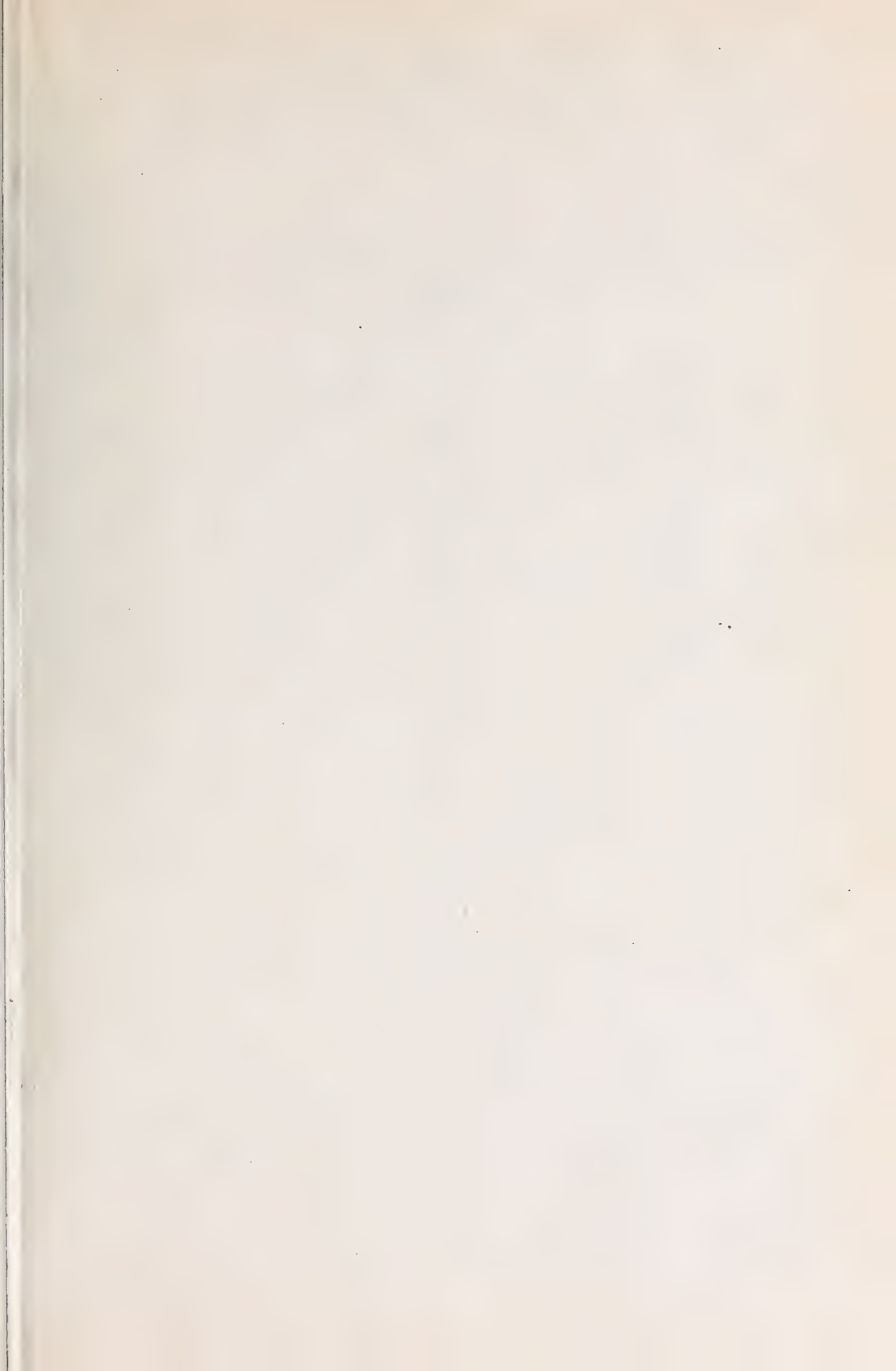
2 Sheets—Sheet 1.

Fig. 1.



Witnesses.
Jno. T. Cross,
J. Henderson.

Inventor,
Eldridge R. Johnson
By 1 time Peter,
Attorney.

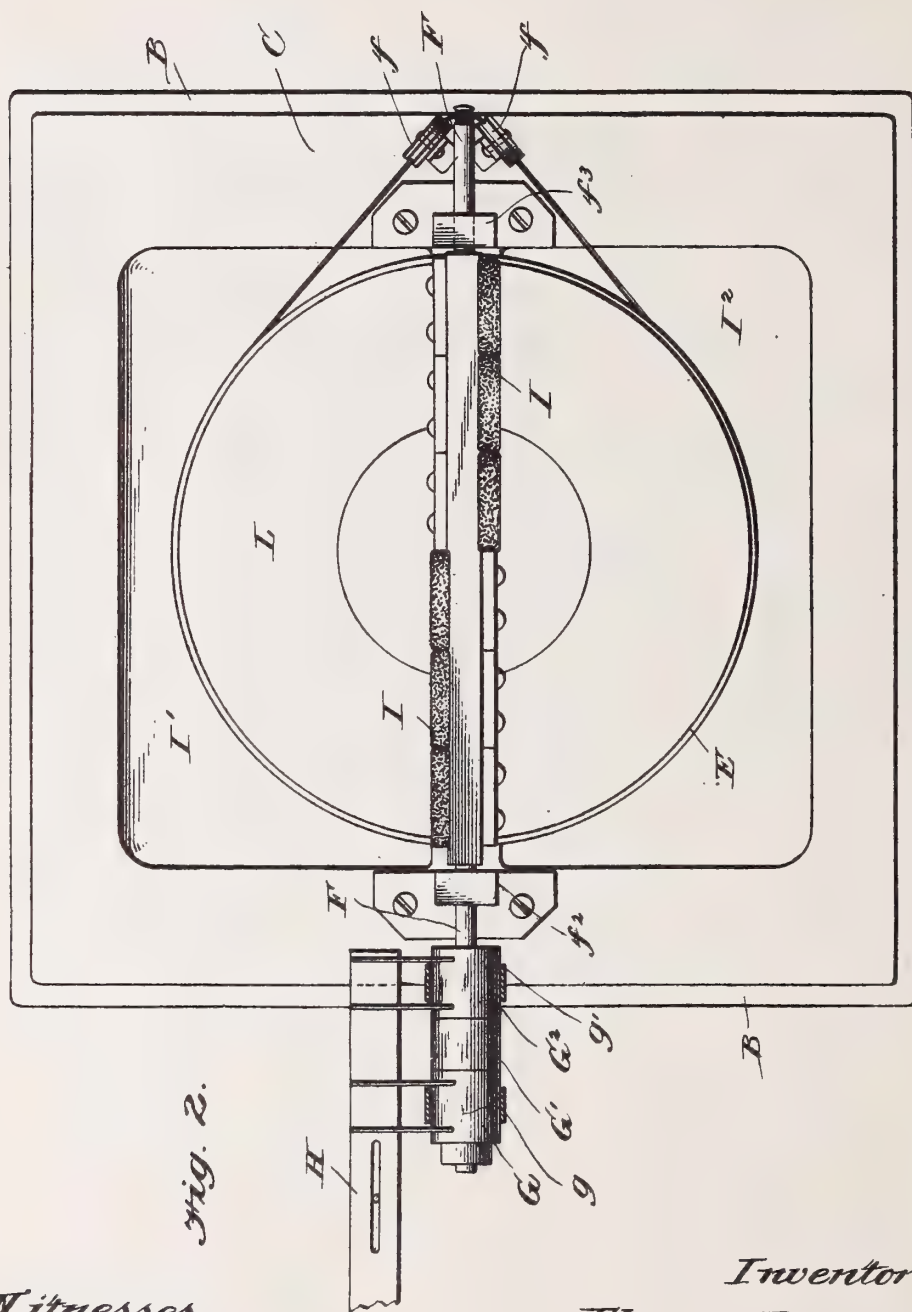


E. R. JOHNSON.
MACHINE FOR LEADING SOUND RECORDS.

(Application filed Jan. 20, 1900.)

(No Model.)

2 Sheets—Sheet 2.



Witnesses.
Jno. T. Cross,
J. Henderson.

Inventor,
Eldridge R. Johnson,
by James P. Peas,
Attorney.

UNITED STATES PATENT OFFICE.

ELDRIDGE R. JOHNSON, OF PHILADELPHIA, PENNSYLVANIA.

MACHINE FOR LEADING SOUND-RECORDS.

SPECIFICATION forming part of Letters Patent No. 681,918, dated September 3, 1901.

Application filed January 20, 1900. Serial No. 2,175. (No model.)

To all whom it may concern:

Be it known that I, ELDRIDGE R. JOHNSON, a citizen of the United States, and a resident of the city of Philadelphia, State of Pennsylvania, have invented certain new and useful Improvements in Machines for Leading Sound-Records, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

My invention relates to an improved construction of machine for leading sound-records after the record-grooves have been recorded therein preparatory to their going to the electroplating-bath; and the principal object of my invention is to provide a machine which will thoroughly coat the records with a finely-granulated graphite or other finely-divided conducting material without in any way impairing the surface of the record. This coating of graphite or other suitable material must be so filmy and thin as practically not to interfere with the proportions of the recorded undulations or to reduce the width or depth of the record-groove. When the record is properly coated or "leaded," it presents upon its entire surface a dull or shiny perfectly smooth appearance.

My invention consists in the construction and arrangement of the parts, substantially as hereinafter fully described, and pointed out in the claims made hereto.

In the accompanying drawings, which form a part of my specification, and in which similar letters are used to indicate similar parts, Figure 1 is a sectional elevation of a machine embodying my improvements. Fig. 2 is a top plan view of the same.

In carrying out my invention I provide a suitable frame, as A, which may be constructed of metal, wood, or other suitable material, having a main supporting-table B, upon which is mounted an adjustable supporting-plate C, which is provided with a central hub adapted to fit in an opening provided in the table B. Through the center of the hub *c* of the plate C is a spindle D, held in its adjusted position by means of the set-screw *d*. The upper end of the spindle *d* is reduced and carries a bushing *e*, which forms the center of a revolving turn-table E. The periphery of the turn-table E is provided with a groove

for the reception of a belt or table which passes under and around a pair of pulleys *f f'*, which are secured to the plate C and are arranged at an angle, so as to guide the said belt up over the main driving-shaft F of the machine. The driving-shaft F is supported on two standards, as *f*² and *f*³, secured to the supporting-plate C, and on the outer extending end of the said shaft F are driving-pulleys G G' G², the middle pulley G' being tight on said shaft and the other pulleys loose. The driving-belts *g g'* are provided together with a shifting-lever H, the said belts running in opposite directions, as shown by the arrows in Fig. 1, so that the main driving-shaft F may be revolved in either direction.

Secured to the driving-shaft between the two standards *f*² *f*³ are the brushes I, arranged in sets, as shown most clearly in Fig. 2, one half of said brushes on one side of the shaft being arranged so as to extend upwardly, while the other half extend downwardly, and on the opposite side of the said shaft the said brushes opposite the upwardly-extending brushes extend downwardly and those opposite the downwardly-extending brushes extend upwardly. The hair composing the brushes is quite long and of a very fine grade of camel's hair and is adapted to sweep the entire surface of the record as they revolve.

On each side of the main shaft F in the supporting-plate C are formed the openings I' I², in which are secured the downwardly-extending chutes J, each chute having provided in its bottom a sliding drawer J', and are adapted to receive the powdered graphite or other material used as it is brushed off the record-disk. An inclosing casing K is provided which sets over the tops of the brushes I, as illustrated in Fig. 1 of the drawings, the said casing serving to prevent the escape of the powdered material during the operation of the machine.

In operation the casing K is removed and the record-tablet L placed in position on the turn-table E, while the brushes are in a horizontal position. The record can be secured to the turn-table in any well-known or convenient manner, and after this has been done the turn-table can be adjusted vertically by loosening the set-screw *d* and raising the

spindle D, so that the record will bear against the brushes I. The casing K is then placed in position and the graphite or other material introduced through a slotted opening *k*, formed in the top of the casing K. The shifting-lever is then operated, which throws one of the belts *g* or *g'* into contact with the intermediate pulley G', and this drives the shaft F, carrying the brushes I. The brushes should revolve very rapidly, and the belting between the shaft F and the turn-table will revolve said turn-table simultaneously with the brushes. During this operation the brushes will come in contact with the entire surface of the record with a sweeping movement, and thus thoroughly coat and polish the entire surface of said record. The graphite as it is swept from the record will fall in the chute J and into the drawers J', from which it can be removed and used over again. After this metallic coating or leading operation has been continued for a period of about fifteen minutes the record will be found to be properly leaded or coated and is then removed and is ready for the electroplating-bath. The brushes should be revolved first in one direction and then in the opposite direction, which can be readily accomplished by means of the double-belt system and shifting mechanism heretofore described.

Various changes in the form and arrangement of my machine might be made without departing from the spirit and scope of my invention. Hence I do not desire to be limited to the exact construction shown and described.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a machine for leading sound-records, the combination with a supporting-frame, of a turn-table mounted therein adapted to support a record-disk, means for adjusting the turn-table vertically, a series of brushes arranged above the turn-table adapted to contact with the record-disk and means for revolving the said brushes in either direction, substantially as described.

2. In a machine for leading sound-records, the combination with a supporting-frame, of a turn-table mounted in said frame, means for the vertical adjustment of said turn-table, a driving-shaft located above the turn-table, a series of brushes alternately arranged on said driving-shaft adapted to contact with the turn-table as the driving-shaft is revolved, means for operating the driving-shaft and for simultaneously operating the turn-table, substantially as described.

3. The combination with the supporting-frame, of a stationary spindle mounted in the center of said frame, a turn-table secured to the upper end of said spindle, means for ad-

justing the spindle vertically, a driving-shaft arranged above the turn-table, a series of brushes carried by the driving-shaft adapted to contact with the turn-table, means for revolving the said driving-shaft, and a connection between the driving-shaft and the turn-table for operating the said turn-table simultaneously with the driving-shaft, substantially as described.

4. The combination with the supporting-frame, of a supporting-plate, C, having a central-hub bearing in the main frame, a spindle, D, secured in said hub, a turn-table loosely mounted on the upper end of said spindle adapted to support a record-tablet, a driving-shaft journaled in bearings carried by the supporting-frame, a series of brushes alternately arranged on the driving-shaft adapted to contact with the record-tablet as the driving-shaft is revolved, means for revolving the said driving-shaft, and a belt connection between the driving-shaft and the turn-table for revolving the said turn-table, substantially as described.

5. The combination of a revolving turn-table adapted to support a sound-record, a driving-shaft located above said turn-table, a series of brushes extending radially from opposite sides of said shaft, and means for revolving the said brushes first in one direction and then in an opposite direction, for the purpose described.

6. The combination with a supporting-table, of a turn-table journaled in the center of said supporting-table, a driving-shaft located above the turn-table, a series of brushes carried by said driving-shaft, a belt surrounding the turn-table and connected with the driving-shaft and a pair of idlers for holding the said belt in operative position, substantially as described.

7. The combination with the supporting-table, B, of a turn-table, C, journaled on said table, a driving-shaft journaled in supports carried by the frame, a series of brushes alternately arranged on said driving-shaft, a belt connection between the driving-shaft and the turn-table for revolving the two simultaneously, a pair of loose pulleys, G, G², arranged on the end of the driving-shaft and an intermediate tight pulley, G', the driving-belts, *g*, *g'*, adapted to run in opposite directions and a shifting-lever for throwing either of the said driving-belts into engagement with the tight pulley, substantially as described.

In witness whereof I have hereunto set my hand this 18th day of January, A. D. 1900.

ELDRIDGE R. JOHNSON.

Witnesses:

JNO. T. CROSS,

BENJ. F. PERKINS.

E. E. RUSSELL.
REPRODUCER FOR PHONOGRAPHS.

(Application filed June 10, 1901.)

(No Model.)

Fig. 1

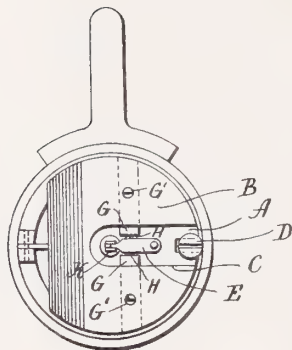


Fig. 4

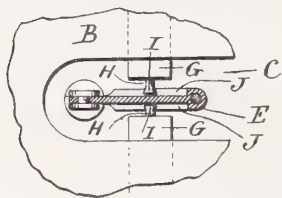


Fig. 3



Fig. 2

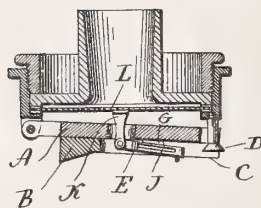


Fig. 7

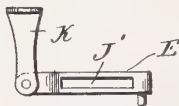


Fig. 8

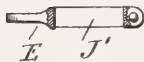


Fig. 5

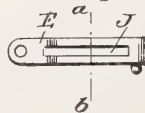
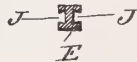


Fig. 6



Witnesses.
J. H. Murray.
Lillian D. Kellogg.

Evans E. Russell,
Inventor.
By atty. Seymour & Carr

UNITED STATES PATENT OFFICE.

EVANS E. RUSSELL, OF NEW HAVEN, CONNECTICUT.

REPRODUCER FOR PHONOGRAPHS.

SPECIFICATION forming part of Letters Patent No. 681,981, dated September 3, 1901.

Application filed June 10, 1901. Serial No. 63,853. (No model.)

To all whom it may concern:

Be it known that I, EVANS E. RUSSELL, of New Haven, in the county of New Haven and State of Connecticut, have invented a new and useful Improvement in Reproducers for Phonographs; and I do hereby declare the following, when taken in connection with the accompanying drawings and the letters of reference marked thereon, to be a full, clear, and exact description of the same, and which said drawings constitute part of this specification, and represent, in—

Figure 1, an under side view of a receiver constructed in accordance with my invention; Fig. 2, a sectional view of the same; Fig. 3, an edge view of the auxiliary weight detached; Fig. 4, a broken under side view, partially in section, showing the manner of mounting the sapphire-arm in the weight; Fig. 5, a side view of the sapphire-arm detached; Fig. 6, a sectional view on line *a b* of Fig. 5; Fig. 7, a side view of a modified form of sapphire-arm connected with a diaphragm-post; Fig. 8, an under side view, partially in section, of the modified sapphire-arm shown in the preceding figure.

This invention relates to an improvement in reproducers for phonographs, graphophones, and other similar sound-reproducing instruments in which the sound is reproduced through a sapphire-arm resting upon a record-cylinder and in connection with a diaphragm, the object of this invention being an improved means for connecting the so-called "sapphire-arms" with the diaphragm and in mounting the sapphire-arm in the weight; and the invention consists in certain details of construction and combinations of parts, as will be hereinafter described, and particularly recited in the claims.

The reproducer herein shown is of ordinary construction and too well known to require description.

To the face of the weight A, I apply an auxiliary weight B, which may be formed integral therewith or formed separately, as shown, so as to be attached to the weight, as at present constructed. In this auxiliary weight is a recess C to give clearance to the weight-retaining screw D and the sapphire-arm E, which is mounted in the weight. As a convenient means for mounting the arm I

form the inner face of the auxiliary weight with undercut grooves F and in these grooves locate corresponding dovetail slides G, in the ends of which are pins H. These pins are preferably formed with enlarged heads I, which extend into undercut grooves J, which are arranged longitudinally in opposite sides of the arm E. The slides G are held in position by set-screws G', extending upward through the face of the auxiliary weight B. The inner end of the arm is adapted to be riveted directly to a post K, which is secured to the face of the diaphragm L and so as to extend therefrom through the weight A. To add to the effectiveness of the auxiliary weight, I increase the thickness at one side, as clearly shown in Fig. 2 of the drawings.

It is apparent that instead of forming headed pins H, as described, a single pin may be employed, which will extend through the sapphire-arm, the arm being provided with a slot J' for that purpose, as shown in Figs. 7 and 8 of the drawings. By thus mounting the sapphire-arm in the weight and connecting it directly with the diaphragm-post the vibrations are saved and a fuller clearer round musical tone is produced than is possible when the sapphire-arm is loosely connected with the diaphragm-post and rigidly connected with the weight.

The operation of this reproducer is the same as those of ordinary construction, and therefore does not require description.

It will be understood that various changes from the details of construction herein shown and described may be made without departing from the spirit and scope of my invention. I therefore do not wish to be understood as limiting the invention to the exact details shown.

Having fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a reproducer, the combination with the diaphragm-post and weight of an auxiliary weight adapted to be secured to the weight, a sapphire-arm pivotally mounted in the said auxiliary weight and connected directly to the diaphragm-post, substantially as described.

2. In a reproducer, the combination with a weight, of slides mounted therein, a sap-

phire-arm mounted between said slides, a diaphragm-post connected directly with one end of said sapphire-arm, substantially as described.

5 3. In a reproducer, the combination with a diaphragm-post and weight, of slides mounted in the said weight and formed with inwardly-projecting headed pins, and a sapphire-arm formed in opposite sides with
10 grooves to receive said pins, and connected

at its inner end directly with the diaphragm-post, substantially as described.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

EVANS E. RUSSELL.

Witnesses:

FREDERIC C. EARLE,
F. C. TUTTLE.



No. 682,424.

Patented Sept. 10, 1901.

J. B. POWELL.

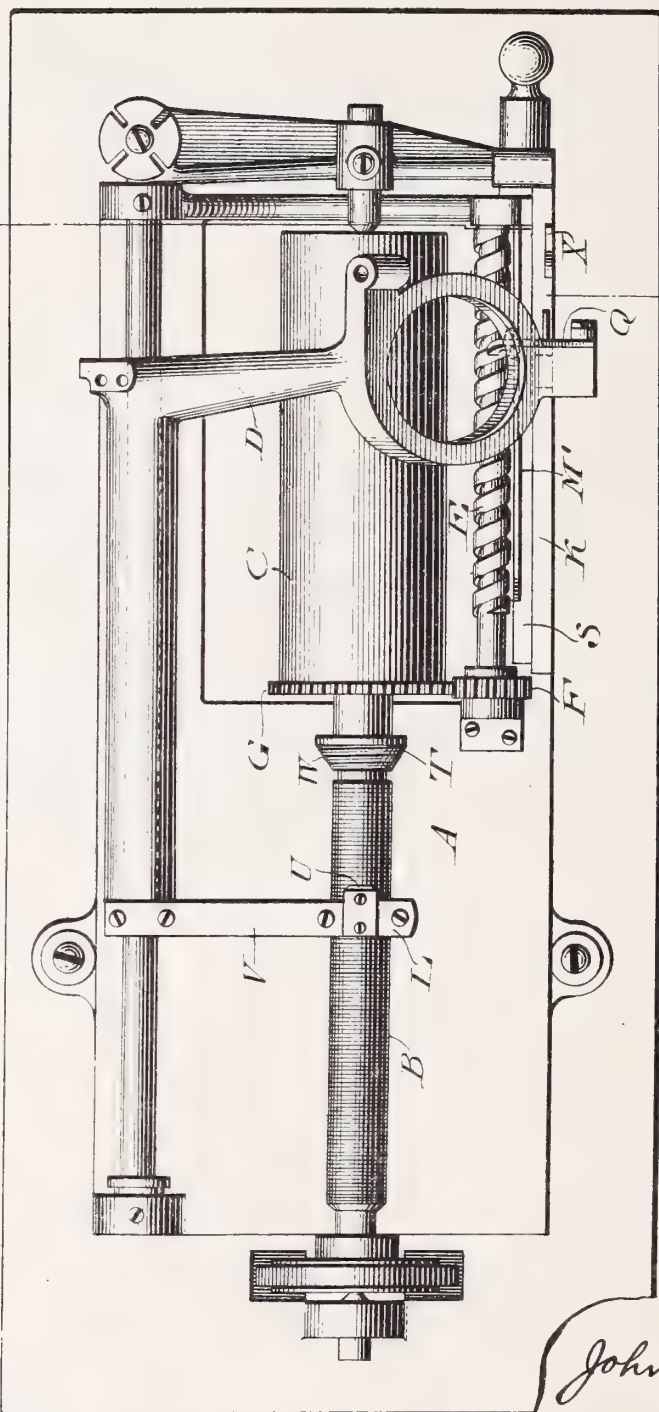
REPEATING MECHANISM FOR PHONOGRAPHS.

(Application filed Jan. 23, 1901.)

(No Model.)

2 Sheets—Sheet 1.

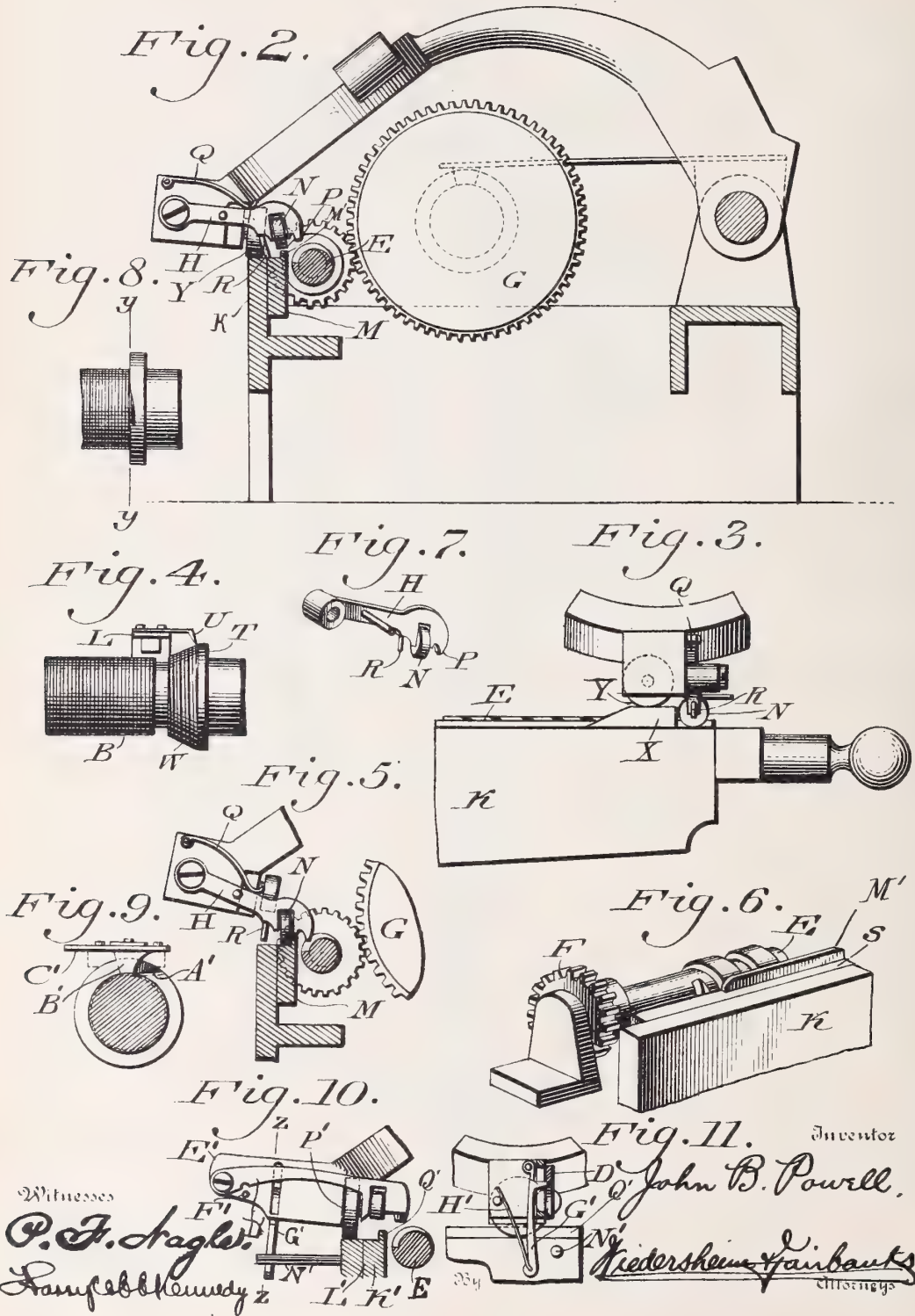
Fig. 1.



Witnesses
P. Schaefer
Harry B. Kennedy

Inventor
John B. Powell

Kiedersheim & Fairbanks
Attorneys



UNITED STATES PATENT OFFICE.

JOHN B. POWELL, OF PHILADELPHIA, PENNSYLVANIA.

REPEATING MECHANISM FOR PHONOGRAPHS.

SPECIFICATION forming part of Letters Patent No. 682,424, dated September 10, 1901.

Application filed January 23, 1901. Serial No. 44,357. (No model.)

To all whom it may concern:

Be it known that I, JOHN B. POWELL, a citizen of the United States, residing in the city and county of Philadelphia, State of Pennsylvania, have invented a new and useful Improvement in Repeating Mechanism for Phonographs, which improvement is fully set forth in the following specification and accompanying drawings.

My invention consists of a repeating mechanism for phonographs, as will be hereinafter fully described and claimed.

Figure 1 represents a top plan of a phonograph provided with my invention. Fig. 2 represents a vertical transverse section taken on the line $x x$ of Fig. 1 and illustrating the parts in the position they assume when a record is being reproduced. Fig. 3 represents a fragmentary front elevation showing the reproducer-arm at the end of its movement just before being reversed and returned by the repeating mechanism. Fig. 4 represents a side elevation of a portion of the feed-shaft and a portion of the arm controlling the reproducer-arm when the latter is about to be reversed and returned to the beginning of the record. Fig. 5 represents a fragmentary vertical transverse section showing the free end of the reproducer-arm and adjacent parts in corresponding position. Fig. 6 represents a perspective view of a portion of the repeating mechanism adjacent the forward end of the record-cylinder. Fig. 7 represents a perspective view of the dog controlling the repeating mechanism. Fig. 8 represents a top plan of another form of device for lifting the reproducer-arm when the reproducer reaches the end of the record. Fig. 9 represents a sectional view of the same, taken on line $y y$ of Fig. 8, showing the feed device of the reproducer-carriage in elevation. Fig. 10 represents a fragmentary side elevation of the end portion of the reproducer-arm and adjacent parts and showing a dog of modified construction. Fig. 11 represents a section thereof on the line $z z$.

Similar letters of reference indicate corresponding parts in the figures.

Referring to the drawings, A designates the bed or frame, B the feed-shaft, C the record-cylinder, and D the reproducer-arm, of a phonograph of familiar construction.

Mounted in bearings upon the bed A, just in front of the cylinder C, is a screw-shaft E, preferably a right-hand screw, that rotates oppositely to the feed-shaft B and cylinder C. The screw-shaft E is geared to the feed-shaft B, preferably by means of a pinion F upon the shaft E and a gear-wheel G, fastened upon the end of the cylinder C. The said screw-shaft E serves to carry the reproducer-arm D from the end to the beginning of the record, this operation being controlled by a dog H upon the arm D, that is automatically thrown into and out of engagement with the screw-shaft E. When the reproducer-arm D is being fed by the feed-shaft to reproduce the record, the operation of the phonograph is as usual, but parallel with the rail K, upon which the free end of the arm D rests in the ordinary operation of the machine when the feed-nut L engages the feed-shaft B, and rising from a plate M is a guide-rail or ledge-flange M', against which a projection of the dog H is adapted to abut, said projection N consisting of an antifriction-roller. The nose P of the dog H engages the screw-shaft E when the roller engages the rail or flange M'. The said dog is pivoted upon the arm D and is depressed by a spring Q, and when the arm D is feeding forward said dog H rests upon the rail K to hold its nose disengaged from the screw-shaft E and against the tension of the spring Q, as shown in Fig. 2, the weight of the arm D and the projection R upon the dog H serving two purposes. The guide-rail M' terminates near the beginning of the record or at the point where it is designed to arrest the return movement of the arm D, although the screw-shaft E extends beyond this end of said rail M' to carry the dog H beyond the end thereof to withdraw it from engagement with the screw-shaft E. To cause the dog H to engage the screw-shaft E when the reproducer reaches the end of the record, the arm D is raised slightly to allow the spring Q to depress the dog to cause the projection or antifriction-roller N to engage the side of the rail M and the nose P to engage the screw-shaft. One construction for carrying out this operation consists in providing the gear-shaft B at its end adjacent the cylinder C with an enlarged portion or cam T, that is engaged by a finger U upon

the arm V, carrying the feed-nut L. The particular form of cam above shown consists of a cone or flaring portion at the end of the shaft B, in which is the groove or thread W to be engaged by the finger U, the pitch of said threads W being much greater than those of the feed-screw, so that the reproducer-arm D is quickly raised to disengage the feed-nut L and feed-shaft B and to permit the dog H to be depressed into engagement with the screw-shaft E. To relieve the arm V and finger U of the entire strain of lifting the reproducer-arm, the rail K is provided with an inclined portion or cam X in the path of the usual roller Y of the reproducer-arm D, that travels upon said rail K and which supports said arm D when the record is being reproduced. The inclination of said cam X is the same as the cam T, and it is located so that the roller Y of the reproducer begins to ride the same as the finger rides the cam T, whereby the heaviest part of said reproducer-arm rests positively upon said cam Y.

The operation is as follows: When the record is being reproduced, the arm D travels in the usual manner, and none of the parts of my invention are active except the pin or projection R, that travels upon the rail K to hold the dog elevated and disengaged from the screw-shaft E, the parts then being in the position shown in Fig. 3. When the reproducer reaches the end of the record, the roller-finger U engages the cam T and the roller Y rides upon the cam X, thus lifting the arm D slightly, but sufficiently to allow the spring Q to depress the dog H to the position shown in Fig. 4. This forces the roller N against the rail M' and the nose P into engagement with the screw-shaft. The arm D is now supported in this position by the roller N, which bears upon the rail M' and the top of plate, and thus sustains the weight of the arm D. The screw-shaft by engagement with the nose P now moves the arm D in the opposite direction until the roller N arrives at the end of the rail M', and being then unsupported the weight of the arm D moves the parts to the position shown in Fig. 2, the pin or projection R contacting with the top of the rail K to hold the nose P clear of the screw-shaft E. When the arm D thus descends, the roller Y again comes in contact with the rail K and the feed-nut L engages the feed-screw B and the reproducer-arm is again fed forward, as shown in Fig. 2.

In Figs. 8 and 9 I have shown a modification in the mechanism for lifting the reproducer-arm when the reproducer reaches the end of the record and which consists practically of a different form of cam from that shown in Fig. 4. In the latter the pitch of the groove or threads W is considerably greater than the pitch of the threads of the feed-shaft B, and in Figs. 8 and 9 the cam A' is abrupt, and when the finger B' of the arm C' engages the same said arm is lifted quickly and in less than a quarter of a rev-

olution of the shaft B in the particular embodiment shown. When using the form of cam shown in Figs. 8 and 9, and when the reproducer-arm is lifted quickly, the cam at the end of the rail K is usually dispensed with.

In Figs. 10 and 11 I have shown another form of dog that engages a screw-shaft E to return the reproducer-arm and its carriage to the beginning of the record. This construction differs from that heretofore described in that it is not operated by reason of the elevation of the reproducer-arm. In Figs. 10 and 11 the dog D' is pivoted upon the end of the reproducer-arm E', a stop-pin F' being employed to limit this downward movement. A catch G' is pivoted upon the end of the arm E', it being provided with a spring H' to hold said catch G' normally in engagement with the bottom of the dog, as shown, to hold the nose thereof out of engagement with the screw-shaft E and its roller above the guide-rail L' and the raised guide rail or flange Q' on the plate K'. A pin N' upon the frame of the machine is situated in the path of the catch G' to engage the same and disengage said catch from the dog D' at the moment that the reproducer-arm is lifted, it being understood that this form of dog can be used in connection with the lifting mechanism shown in Fig. 4 or 8 equally as well. It will thus be seen that when the reproducer reaches the end of the record the arm is lifted and the dog is released by independent mechanism, although both will depend upon the movement of the reproducer-arm and its carriage. It will be evident that when the dog descends its nose engages the screw-shaft E and its roller engages the guide-rail Q'. The reproducer-arm and carriage are thus returned in the manner above described until the end of said guide-rail Q L' is reached, whereupon the reproducer-arm again descends upon its roller P', which lifts the dog D', so that it is engaged by the catch and held in the position shown in Fig. 10.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination with a phonograph, of a screw shaft geared to the driving mechanism thereof, a dog carried by the reproducer-arm of said phonograph adapted to engage said screw-shaft, means for lifting said reproducer-arm and means for moving said dog into engagement with the screw-shaft when the reproducer-arm reaches one limit of its movement, means independent of the means for lifting said reproducer-arm for supporting the same in its raised position, said supporting means terminating near the other limit of movement of the reproducer-arm, whereby the reproducer-arm is lowered, and means for disengaging said dog and screw-shaft when the reproducer-arm is lowered.

2. In a phonograph, a reproducer-arm provided with a dog, a screw-shaft geared to the driving mechanism of the phonograph and adapted to be engaged by said dog to return

the reproducer-arm to the beginning of the record, means independent of said dog for lifting said reproducer-arm and means for moving said dog into engagement with said screw-shaft, when the reproducer-arm reaches one limit of its movement, said dog being provided with means for engaging a portion of the frame of the machine to support said reproducer-arm in elevated position when the dog engages the screw-shaft, said reproducer-arm being lowered at the other limit of its movement when the dog reaches the end of and becomes disengaged from said portion of the frame of the machine and means for disengaging said dog and screw-shaft when the reproducer-arm is lowered.

3. In a phonograph, a feed-shaft, a record-cylinder, a reproducer-arm and its carriage, a screw-shaft geared to the driving mechanism of the phonograph, a dog carried by said reproducer-arm and adapted to engage and be disengaged from said screw-shaft, a cam independent of said dog to engage a portion of the reproducer-carriage when the reproducer reaches the end of its movement to lift said reproducer-arm, means for moving said dog into engagement with said screw-shaft when said reproducer-arm is lifted, said dog engaging a portion of the frame of the machine when the reproducer-arm is lifted to support said arm in said elevated position, said reproducer-arm being lowered at the other limit of its movement when the dog reaches the end of and becomes disengaged from said portion of the frame of the machine and means for disengaging said dog and screw-shaft when the reproducer-arm is lowered.

4. In a phonograph, a feed-shaft provided with a cam, a screw-shaft geared to said feed-shaft, a reproducer-carriage having an arm provided with a finger to engage said cam and adapted to lift the reproducer-arm of said carriage when the latter reaches one limit of its movement, a dog carried by said carriage and adapted to engage said screw-shaft when the reproducer-arm is lifted, said dog engaging a portion of the frame of the machine when the carriage is being fed by the feed-shaft to hold said dog disengaged from said screw-shaft, means for throwing said dog into engagement with said screw-shaft when the reproducer-arm is lifted, said dog engaging a portion of the frame of the machine when the reproducer-arm is lifted to support the reproducer-arm in its raised position, said reproducer-arm being lowered at the other limit of its movement when the dog reaches the end of and becomes disengaged from said portion of the machine, whereby the reproducer-arm can be fed by the feed-shaft and means for disengaging said dog and screw-shaft when the reproducer-arm is lowered.

5. In a phonograph, a feed device provided with a gear, a screw-shaft having a pinion meshing with said gear, a cam upon said feed-shaft, a finger upon the arm of the reproducer-carriage to engage said mechanism, a dog

upon said reproducer-arm adapted to engage said screw-shaft when the reproducer-arm is lifted at one limit of its movement, means for supporting said reproducer-arm in raised position, said supporting means terminating near the other limit of movement of the reproducer-arm, whereby the latter is lowered, and means for disengaging said dog and screw-shaft when the reproducer-arm is lowered.

6. In a phonograph, a feed-shaft, a reproducer-arm, a feed-arm therefor, said reproducer-arm and said feed-arm being adapted to be raised and lowered to disengage and engage the feed-arm and feed-shaft, said feed-shaft serving to feed the reproducer-arm in one direction, a screw-shaft geared to said feed-shaft and adapted to feed in the opposite direction, a guide-rail extending a portion of the length of said screw-shaft, means for lifting the reproducer-arm at one limit of its movement to disengage said feed-arm and shaft, a spring-depressed dog on said reproducer-arm provided with a roller to engage said guide-rail when the reproducer-arm is lifted, and to hold it elevated, a nose on said dog to engage the screw-shaft when the reproducer-arm is lifted, whereby the latter is fed in the opposite direction, said reproducer-arm being lowered at the other limit of its movement when the roller reaches the end of and becomes disengaged from the guide-rail, whereby the feed-arm engages the feed-shaft, and said dog engaging a stationary portion of the machine when the reproducer-arm is lowered and serving to hold the nose disengaged from said screw-shaft, and the roller disengaging from said guide-rail.

7. In a phonograph, a feed-shaft for moving the reproducer-arm in one direction, a screw-shaft having threads of a different pitch for moving the arm in the opposite direction, means for raising said reproducer-arm at one limit of its movement, and means for connecting it with the screw-shaft, and means for supporting said reproducer-arm in its raised position, said means being independent of the means for lifting the same, and terminating near the other limit of movement of the reproducer-arm whereby the latter is lowered and connected with the feed-shaft.

8. In a phonograph, a feed-shaft provided with means for elevating the feed-nut to move the same from engagement therewith, a stationary cam situated in the path of the reproducer-arm to elevate the same when the feed-nut is disengaged from the feed-shaft, and means for moving the said reproducer-arm in the opposite direction to that in which it is moved by said feed-shaft.

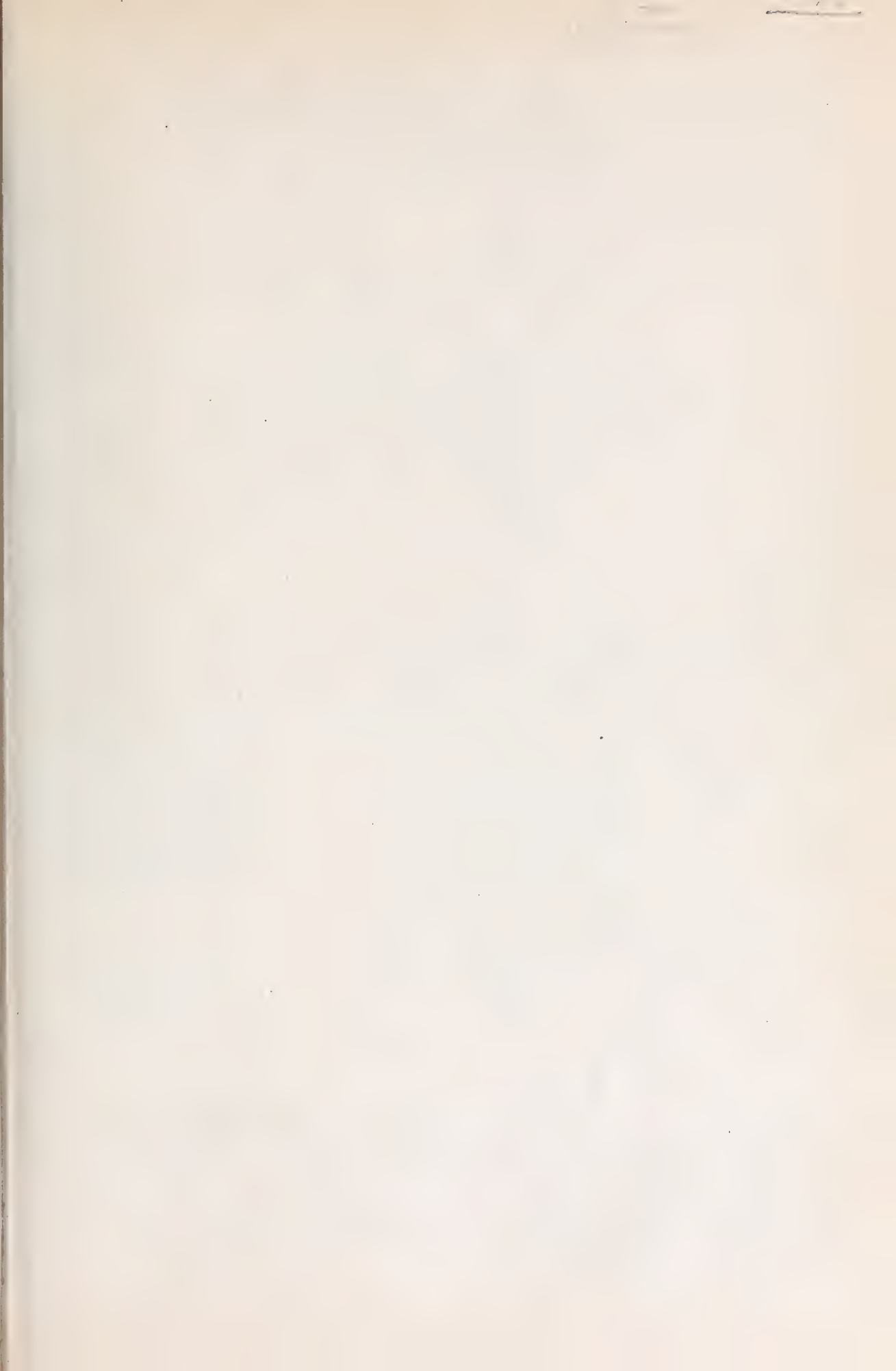
9. In a phonograph, a guide-rail, a reproducer-arm having a dog provided with a projection to engage said guide-rail and to support said reproducer-arm in an elevated position, said projection bearing against the side of said guide-rail, a feed device for moving

said reproducer-arm in one direction, a screw-shaft for moving the same in the opposite direction, means for lifting said arm at one limit of its movement to allow said projection to engage said guide-rail and said dog to engage said screw-shaft when the reproducer-arm is lifted, and a rail upon which said arm rests when the projection of the dog passes beyond the end of the guide-rail and allows said arm to descend.

JOHN B. POWELL.

Witnesses:

JOHN A. WIEDERSHEIM,
HARRY COBB KENNEDY.



No. 682,991.

Patented Sept. 17, 1901.

T. H. MACDONALD.

PROCESS OF MAKING SOUND RECORDS.

(Application filed Nov. 3, 1900.)

(No Model.)

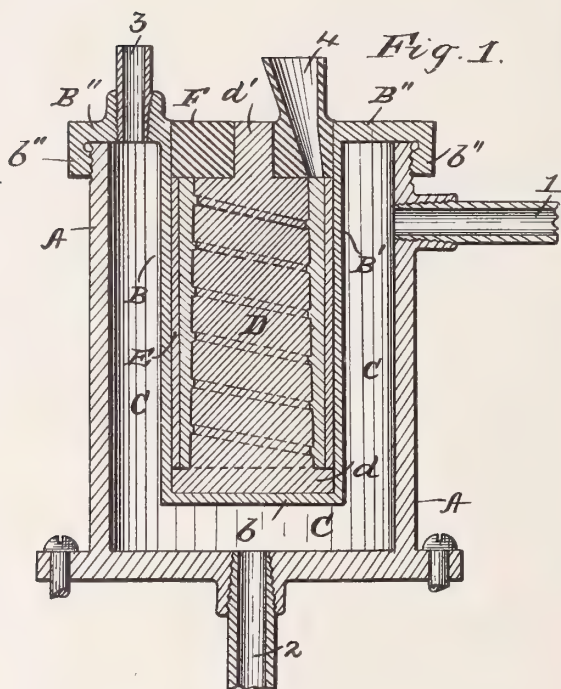
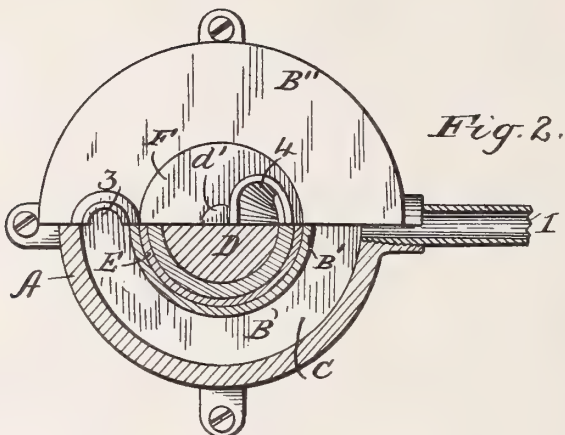


Fig. 3.



Witnesses

W. R. Edelen.

[Signature]

Inventor

Thomas H. Macdonald

by *[Signature]*
his atty.

UNITED STATES PATENT OFFICE.

THOMAS H. MACDONALD, OF BRIDGEPORT, CONNECTICUT.

PROCESS OF MAKING SOUND-RECORDS.

SPECIFICATION forming part of Letters Patent No. 682,991, dated September 17, 1901.

Application filed November 3, 1900. Serial No. 35,351. (No model.)

To all whom it may concern:

Be it known that I, THOMAS H. MACDONALD, a citizen of the United States, and a resident of Bridgeport, Connecticut, have invented a new and useful Process of Making Sound-Records, which is fully set forth in the following specification.

This invention relates to improvements in sound-records and in the method of producing them by molding; and it consists in first superheating the material while in the mold and in then suddenly applying cold, whereby I obtain better results than heretofore possible.

The invention consists, further, in certain details to be hereinafter pointed out.

In order to explain my invention more readily, I refer to the annexed drawings, which show one form of apparatus for carrying out my process.

Figure 1 is a vertical sectional view; and Fig. 2 is a plan, partly broken away. Fig. 3 is intended to illustrate the improved sound-record.

The record is cast into a suitable mold, which is surrounded by a steam and water jacket for superheating and cooling the casting. This jacket consists of an outer shell A and an inner shell B for the mold, these shells inclosing between them the steam-tight space C. Shell A is closed at the bottom and open at the top for receiving shell B and is provided with valve-controlled inlets 1 and 2 for steam and cold water, respectively. Shell B consists of a hollow cylinder B', also closed at the bottom *b* and open at the top, and has an annular flange B'', that rests upon the top of shell A and is secured thereto, as by screw-threaded lip *b''*. Flange B'' constitutes the cover of the inclosed space C and serves to suspend shell B therein and is provided with the valve-controlled outlet 3. Core D has the base *d* fitting snugly in shell B' and resting on bottom *b* and at its upper end carries the stem *d'*. A suitable matrix E is fitted snugly into shell B to rest upon base *d*. A head F is inserted in the top of shell B and rests squarely upon the top of matrix E and core D, stems *d'* taking into a suitable opening in the head, which thus assists in securing the core in proper position. The annular space between the matrix and the core (con-

stituting the mold) is thus inclosed by the base *d* and the head F. The head is provided with the funnel 4, forming an inlet for pouring into the mold the melted material that is to form the improved sound-record.

In carrying out my invention I proceed as follows: I fill the mold (through funnel 4) with the melted material, (soap mixture or the like,) which is hereinafter, for convenience, designated "wax," though I do not limit myself to a wax-like composition, since any suitable material or composition that can be readily handled may be employed and will come within the scope of my invention. I then admit steam through inlet 1 into the space C and heat the mold and its contents up to, say, about 350° centigrade and maintain the heat for some time, preferably until the entire mass of the wax is in a limpid state. This superheating forces out all air-bubbles from the mass of the wax and from the minute spaces in and around the irregularities in the matrix-surface, thus producing a more intimate relation between the molten wax and the matrix. After maintaining this heat for a length of time sufficient to drive off all bubbles and impurities I then admit cold water through inlet 2 and allow the steam to escape through outlet 3. This sudden application of cold chills the surface of the wax instantly and symmetrically and causes it to contract from the matrix-surface sufficiently to clear the now-solidified casting from the matrix and permit its withdrawal. The fact that the cold acts evenly from all sides causes the contracting to be even and regular, so that cracking, &c., are avoided. Moreover, owing to the abnormal compression or concentration of the molten mass during the period of superheating and also to the subsequent enormous force of contraction due to the sudden chilling of its surface, the sound-record molded by my process is much denser and harder on the surface than in case of an ordinary record made in the usual manner. It is, so to speak, "case-hardened" or tempered. Further, inasmuch as this symmetrical chilling effect takes place from the exterior of the mold and its casting I have discovered that with the composition at present employed (which is a mixture of two ingredients, as stearic acid and ceresin, both the

hardness and the melting-point or solidifying-point of one ingredient being higher than those of the other) the first effect of this sudden exterior chilling is an initial reduction of the temperature to a point below the solidifying-point of the harder ingredient, which is thereupon converted into a thin shell or film, while the softer ingredient (still remaining liquid) is consequently forced inward. The result is as already indicated—viz., a casting whose exterior surface is much harder and denser than its mass, though the gradation is so gradual and imperceptible that there is no line of separation that might cause the outer casing to break off or the inner to shrink away.

Instead of admitting steam after the wax has been poured into the mold it may be admitted simultaneously or beforehand, as the object to be accomplished is the superheating of the molten mass and the maintaining of that heat. It is obvious that other means may be employed for superheating the material while in the mold.

Among the superior advantages of my case-hardened record so produced are that the mass being denser is less liable to be affected by changes of temperature and moisture and that being harder it is not so readily worn out by the action of a reproducing-stylus. Besides, while it would be difficult to engrave a satisfactory original sound-record upon a surface as hard as that produced by my process, yet by this process a sound-record equally as good as an original record is readily and cheaply produced in a more durable condition.

Of course I do not limit myself either to a cylindrical sound-record or to one of the type characterized by vertical irregularities, since the spirit of my invention consists in maintaining the molten wax (while in connection with its matrix) in a superheated condition and in then suddenly and symmetrically chilling it.

The record produced by the process herein described gives improved results in reproduction and is more durable than records made by direct engraving. In the latter the surface over which the reproducer-point rubs in reproducing is made by a cutting or scraping instrument having a blunt edge. When this surface is examined under a magnifying-glass, it is seen to be roughly broken, the molecules of wax having been disturbed and

their adhesion to one another weakened. The reproducing-stylus rubbing over such a surface detaches these projecting particles, further roughening the surface, and causing scratching sounds in the reproduction. On the other hand, the surface of the molded record being formed by the cooling of melted particles strongly adherent one to another offers far greater resistance to roughening by the reproducer. Such records therefore have longer life than those made in the ordinary way.

The improved sound-record resulting from the process herein described is claimed in a divisional application filed May 21, 1901, Serial No. 61,267.

Having thus described my invention, I claim—

1. The process of molding sound-records which consists in filling a suitable matrix with a suitable composition, maintaining the same for a length of time in a superheated condition, and then suddenly and symmetrically chilling it, substantially as described.

2. The process of making a sound-record, which consists in pouring a suitable melted material into a suitable matrix-mold, then admitting steam into a jacket surrounding said matrix and continuing this step until the said material has become limpid and impurities are driven off and the said material forced into intimate contact with its matrix, then allowing the steam to escape and admitting cold water into the jacket whereby the said material is suddenly and symmetrically chilled from its exterior surface next its matrix, substantially as and for the purpose set forth.

3. The process of molding sound-records which consists in filling a suitable matrix with a suitable material and maintaining the same for a length of time in a superheated condition, and then suddenly and symmetrically chilling the same from the exterior inward, substantially as and for the purpose described.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

THOMAS H. MACDONALD.

Witnesses:

W. R. MILLER,

W. C. LEWIS.

UNITED STATES PATENT OFFICE.

THOMAS H. MACDONALD, OF BRIDGEPORT, CONNECTICUT.

SOUND-RECORD.

SPECIFICATION forming part of Letters Patent No. 682,992, dated September 17, 1901.

Original application filed November 3, 1900, Serial No. 35,351. Divided and this application filed May 21, 1901. Serial No. 61,267. (No model.)

To all whom it may concern:

Be it known that I, THOMAS H. MACDONALD, of Bridgeport, Connecticut, have invented a new and useful Improvement in Sound-Records, which invention is fully set forth in the following specification.

This invention relates to an improvement in sound-records; and it consists in the improved record itself, this application being a division of my application, filed November 3, 1900, Serial No. 35,351.

In order to explain my invention more readily, I refer to the annexed drawings, which show one form of apparatus for carrying out my process.

Figure 1 is a vertical sectional view; and Fig. 2 is a plan, partly broken away. Fig. 3 is intended to illustrate the improved sound-record.

The record is cast into a suitable mold, which is surrounded by a steam and water jacket for superheating and cooling the casting. This jacket consists of an outer shell A and an inner shell B for the mold, these shells inclosing between them the steam-tight space C. Shell A is closed at the bottom and open at the top for receiving shell B and is provided with valve-controlled inlets 1 and 2 for steam and cold water, respectively. Shell B consists of a hollow cylinder B', also closed at the bottom *b* and open at the top, and has an annular flange B'', that rests upon the top of shell A and is secured thereto, as by screw-threaded lip *b''*. Flange B'' constitutes the cover of the inclosed space C and serves to suspend shell B therein and is provided with the valve-controlled outlet 3. Core D has the base *d* fitting snugly in shell B' and resting on bottom *b* and at its upper end carries the stem *d'*. A suitable matrix E is fitted snugly into shell B to rest upon base *d*. A head F is inserted in the top of shell B and rests squarely upon the top of matrix E and core D, stems *d'* taking into a suitable opening in the head, which thus assists in securing the core in proper position. The annular space between the matrix and the core (constituting the mold) is thus inclosed by the base *d* and the head F. The head is provided with the funnel 4, forming an inlet for pouring

into the mold the melted material that is to form the improved sound-record.

In carrying out my invention I proceed as follows: I fill the mold (through funnel 4) with the melted material, (soap mixture or the like,) which is hereinafter for convenience designated "wax," though I do not limit myself to a wax-like composition, since any suitable material or composition that can be readily handled may be employed and will come within the scope of my invention. I then admit steam through inlet 1 into the space C and heat the mold and its contents up to, say, about 350° centigrade and maintain the heat for some time, preferably until the entire mass of the wax is in a limpid state. This superheating forces the melted wax into a more intimate relation with the matrix and expels all air-bubbles from the mass of the wax and from the minute spaces in and around the irregularities in the matrix-surface, thus producing a more intimate contact between the molten wax and the matrix. After maintaining this heat for a length of time sufficient to drive off all bubbles and impurities I then admit cold water through inlet 2 and allow the steam to escape through outlet 3. This sudden application of cold chills the surface of the wax instantly and symmetrically and causes it to contract from the matrix-surface sufficiently to clear the now-solidified casting from the matrix and permit its withdrawal. The fact that the cold acts evenly from all sides causes the contracting to be even and regular, so that cracking, &c., are avoided. Moreover, owing to the abnormal compression or concentration of the molten mass during the period of superheating and also to the subsequent enormous force of contraction due to the sudden chilling of its surface, the sound-record molded by my process is much denser and harder on the surface than in case of an ordinary record made in the usual manner. It is, so to speak, "case-hardened" or tempered. Further, inasmuch as this symmetrical chilling effect takes place from the exterior of the mold and its casting I have discovered that with the composition at present employed (which is a mixture of two ingredients, as stearic 100

acid and ceresin, both the hardness and the melting-point or solidifying-point of one ingredient being higher than those of the other) the first effect of this sudden exterior chilling is an initial reduction of the temperature to a point below the solidifying-point of the harder ingredient, which is thereupon converted into a thin shell or film, while the softer ingredient (still remaining liquid) is consequently forced inward. The result is as already indicated—viz., a casting whose exterior surface is much harder and denser than its mass, though the gradation is so gradual and imperceptible that there is no line of separation that might cause the outer casing to break off or the inner to shrink away.

Instead of admitting steam after the wax has been poured into the mold it may be admitted simultaneously or beforehand, as the object to be accomplished is the superheating of the molten mass and the maintaining of that heat. It is obvious that other means for superheating the material may be employed.

Among the superior advantages of my case-hardened record so produced are that the mass being denser is less liable to be affected by changes of temperature and moisture and that being harder it is not so readily worn out by the action of a reproducing-stylus. Besides, while it would be difficult to engrave

a satisfactory original sound-record upon a surface as hard as that produced by my process, yet by this process a sound-record equally as good as an original record is readily and cheaply produced in a more durable condition.

Of course I do not limit myself either to a cylindrical sound-record or to one of the type characterized by vertical irregularities.

I claim—

1. A sound-record of suitable composition having the surface of the undulatory record case-hardened or tempered, substantially as described.

2. A sound-record of suitable material having its surface case-hardened or tempered and graduating inward into a comparatively softer mass by imperceptible degrees, substantially as described.

3. A molded sound-record of suitable composition having the surface of the undulatory record case-hardened or tempered.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

THOMAS H. MACDONALD.

Witnesses:

M. A. FOGO,

A. B. KEOUGH.

182,130

No. 683,130.

Patented Sept. 24, 1901.

T. H. MACDONALD.
TOY GRAPHOPHONE.

(Application filed Feb. 21, 1899.)

(No Model.)

Fig. 1.

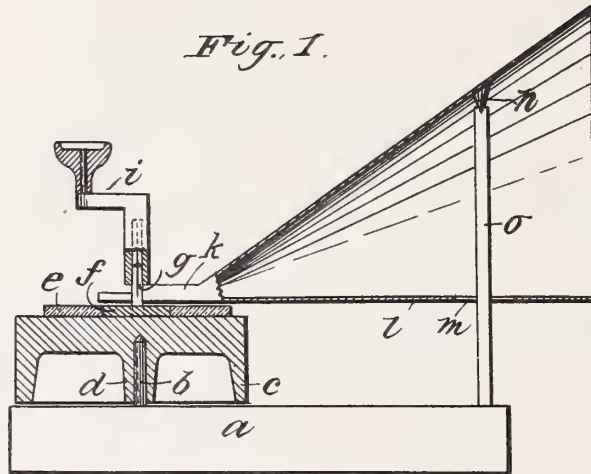
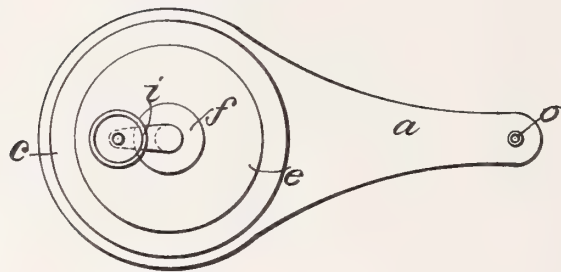


Fig. 2.



Witnesses,

H. R. Edglin,
Atty. Genl.,

Inventor

Thomas H. Macdonald
by Philip Harris
his attorney

UNITED STATES PATENT OFFICE.

THOMAS H. MACDONALD, OF BRIDGEPORT, CONNECTICUT, ASSIGNOR TO
AMERICAN GRAPHOPHONE COMPANY, OF WASHINGTON, DISTRICT OF
COLUMBIA.

TOY GRAPHOPHONE.

SPECIFICATION forming part of Letters Patent No. 683,130, dated September 24, 1901.

Application filed February 21, 1899, Serial No. 706,411. (No model.)

To all whom it may concern:

Be it known that I, THOMAS H. MACDONALD, a resident of the city of Bridgeport, State of Connecticut, have invented a new and useful
5 Improvement in Toy Graphophones, which invention is fully set forth in the following specification.

The object of this invention is to produce a toy graphophone. To accomplish this object it is necessary to secure certain results which are difficult to attain in one structure. The construction must be so simple as to admit of very economical manufacture. It must also be very simple in operation, so that its use can be readily understood by children. It must be free from difficult adjustment and complication of all sorts. It must be substantial and not liable to easy derangement or breakage of any part, and these results must be attained without sacrifice of the property of distinct reproduction of the recorded sounds. These results are attained, according to the present invention, mainly by the construction of the tablet-holder, which is in the form, preferably, of a heavy disk mounted to rotate or spin upon a center. This tablet-holder while serving its normal purpose acts also (by virtue of its inertia) as a speed-governor. In its preferred form the tablet-holder is a disk weighing, say, one and one-half or two pounds, having a long central bearing and resting removably upon a vertical pin having a conical upper end. The record-tablet, in the form of a disk, rests upon the flat top of this tablet-holder, and if this surface be covered with felt or similar material it is unnecessary to employ any means for attaching the tablet to the tablet-holder. The latter can be rotated by any suitable means—for example, by a string wound around its shaft (as in spinning a top) or by a crank-handle. In the wheel thus mounted we have the essential elements of a tablet-holder, motor, and speed-governor, the frame consisting merely of a base-plate with an upright pin. With these parts can be combined recording and reproducing devices of known or suitable constructions. As the apparatus would ordinarily be used only for reproducing, the
50 following construction is preferred. The base-

plate is provided with a second vertical pin and post longer than the first. The reproducer is rigidly attached at the mouth of a horn, which is supported pivotally on said post and can swing thereon freely. The combined horn and reproducer are nearly balanced on their support, there being a slight preponderance of weight at the reproducer end, so that the latter will bear with light pressure on the tablet. These constitute all the essential parts. They may of course be modified in construction so as to adapt them to various kinds of toys, as will be readily understood.

In order that the invention may be fully understood, one form of embodiment thereof will be described in detail, reference being had to the accompanying drawings, wherein—

Figure 1 is a sectional elevation of an apparatus constructed in accordance with the invention, and Fig. 2 is a top view, the horn and reproducer being omitted.

a represents a base-plate, which may be of wood or other suitable material, and *b* a pin having at its upper end a conical bearing-point. The wheel *c* is centrally supported on this pin. Said wheel has a long hub *d* to prevent lateral strain and cause it to run true. It is so shaped that the greater part of its weight is at the periphery, so that it will store up considerable energy. This wheel may be employed to impart motion to the tablet in any suitable way; but preferably the tablet *e* rests directly on its upper surface. The tablet *e* is of disk form, having a central aperture of such size as to fit around a boss *f* on wheel *c*, which centers the tablet.

From the wheel *c* rises a short spindle *g*, and I have shown as a means of imparting motion thereto a removable crank-handle *i*, whose upper surface is hollowed out to receive the finger of the operator. It has been found that by imparting a few turns to the wheel *c* it will acquire considerable momentum and spin on its center long enough to reproduce a record of considerable length, while by keeping one finger in contact with the crank-handle and turning with very slight force the speed will be maintained with practical uniformity.

The reproducer *k* (of any known or suitable type) is affixed rigidly to the small end of horn *l*. The latter has a slot or aperture *m* through one side, and at a diametrically opposite point is provided a small cone-bearing *n*, which engages in a depression or socket formed in the top of post *o*. The combined horn and reproducer are thus very delicately balanced and are easily put in place or removed. In operation the reproducer rests with proper predetermined pressure on the tablet and adjusts itself automatically, being guided by the record in the usual manner.

I claim—

1. In a graphophone, a weighted disk having a flat face or surface against which a record-tablet is adapted to be supported, said disk being adapted when put in motion to store up energy and act as a fly-wheel and speed-regulator, a central bearing on which the disk is supported and adapted to be rotated, a crank projecting centrally from the disk and having a depression or recess at its upper extremity in which the finger of an operator is adapted to be engaged to rotate the disk.

2. A graphophone consisting of a base, a weighted disk having a flat upper face for supporting a record-tablet, said disk being adapted when put in motion to store up energy and

act as a fly-wheel and speed-regulator, a pin projecting upwardly from one end of the base and having a conical point, said pin loosely engaging in a centrally-located socket in the under side of the disk, a short spindle projecting upwardly from the center of the disk, a crank on said spindle for rotating the weighted disk, a horn having a reproducer attached to its small end and having a perforation through its lower side, an upright post on the other end of the base passing through the perforation in the horn, and a bearing-point attached to the inside of the horn opposite to the perforation and engaging the top of said post.

3. The combination with the tablet-holder, of a horn having a reproducer attached to its small end, and having a perforation through one side, an upright post passing through said perforation, and a bearing-point attached to the inside of the horn opposite to the perforation, and engaging the top of said post.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

THOMAS H. MACDONALD.

Witnesses:

MARY FOGO,

CLARA GIBNER.



UNITED STATES PATENT OFFICE.

WALTER HENRY MILLER, OF ORANGE, AND JONAS WALTER AYLSWORTH, OF EAST ORANGE, NEW JERSEY, ASSIGNORS TO NATIONAL PHONOGRAPH COMPANY, OF ORANGE, NEW JERSEY.

METHOD OF DUPLICATING PHONOGRAPHIC RECORDS.

SPECIFICATION forming part of Letters Patent No. 683,615, dated October 1, 1901.

Application filed July 31, 1900. Serial No. 25,391. (No specimens.)

To all whom it may concern:

Be it known that we, WALTER HENRY MILLER, of Orange, and JONAS WALTER AYLSWORTH, of East Orange, in the county of Essex and State of New Jersey, citizens of the United States, have invented a certain new and useful Method of Duplicating Phonographic Records, of which the following is a description.

Our invention relates to an improved process of duplicating phonographic records; and our object is to provide a process by which the duplicating of phonographic records can be carried on expeditiously and economically and duplicate records produced which are of superior quality.

In carrying out our invention into effect we first secure a matrix or mold from which copies are to be produced, said matrix or mold being made by any suitable and approved process—as, for instance, by a process of electroplating on a vacuous deposit preliminarily secured upon an original phonographic cylinder, the electroplating being suitably backed up and strengthened by a metal jacket and the original cylinder being removed from the electroplated coating in any suitable way, as by melting the record or by contracting it by cold. The resulting matrix will obviously be a cylinder carrying on its bore a representation in negative or relief of the original record. From the matrix or mold secured in this or in any other approved way we make duplicates by a process of immersion or dipping of the matrix or mold in a bath of molten wax-like material from which the duplicates are to be secured, whereby a coating or covering of such material will be deposited upon the interior of the matrix or mold by reason of the lower temperature of the matrix or mold. After thus securing a sufficiently thick coating of material on the interior of the matrix or mold we remove the latter from the bath, carrying the deposited material with it, and we properly finish the duplicate so secured by reaming its interior to gage, trimming one of its ends, and afterward shrinking the duplicate from the matrix or mold.

In carrying out our improved process we

may utilize any suitable apparatus for the purpose, and the apparatus illustrated in the accompanying drawings, which form a part of this specification, is merely an illustrative one and we do not wish to be limited thereto.

In the drawings, Figure 1 is a sectional view of the apparatus and mold in which the deposit or coating of the wax-like material is secured; Fig. 2, a corresponding view of the apparatus for properly reaming the interior of the duplicates; Fig. 3, a similar view of the apparatus employed for the shrinking of the duplicates from the matrix or mold, and Fig. 4 an enlarged corresponding view of one of the resulting duplicates.

In all of the above views corresponding parts are represented by the same numerals of reference.

1 represents a matrix or mold carrying on its bore the representation of the record which is to be duplicated, said representation being obviously in negative or relief. This matrix or mold is made by any approved process and is not a part of our invention.

2 is a metal cap which is removably fitted upon the upper end of the matrix or mold, with its bore corresponding in diameter with the bore of the matrix or mold.

3 is a metal disk provided with a handle 4, connected to side bars 5 5 and by which the disk may be manipulated. The matrix or mold 1 is carried by the disk 3, as shown. An opening 6 in the disk 3 is of considerably less diameter than the bore of the matrix or mold, and around said opening 6 and within the bore of the matrix or mold the disk may be formed in negative with a representation 7 of suitable words or characters to indicate the subject-matter of the duplicated record, its source of origin, &c.

8 is a sheet-metal receptacle provided with a handle 9 and which carries the disk 3 and the matrix or mold 1, as shown. The receptacle 8 is provided with an opening 10 therein, which may be of the same or of larger size than the opening 6 in the disk 3.

11 represents a tank which contains, as indicated, a proper supply of suitable wax-like material from which the duplicates are to be made and which material may be the

ordinary commercial phonographic compositions now in use. The material in the tank 11 may be kept in a molten condition by heat applied in any suitable way, as by means of a gas-burner 12.

In carrying out our process with the apparatus so far described we place the matrix or mold on the disk 3 and insert the latter, carrying the matrix or mold in the receptacle 8, as shown, after which the receptacle 8 is immersed in the molten material within the tank 11, which is permitted to enter the matrix or mold to a point above the upper end of the latter, but below the top of the cap 2, so that the material fills the interior of the matrix or mold, but does not overflow the same. The matrix or mold is thus kept immersed in the molten material for the desired time required to secure a deposit of the wax-like material of the required thickness. With the ordinary commercial phonographic composition now used maintained at from 20° to 40° above its melting-point and with a matrix or mold having a thickness of about one-fourth of an inch a deposit of material will be formed on the interior of the matrix or mold of the desired thickness after an immersion of about three minutes. Obviously, however, this time will vary with the peculiar conditions under which the process may be carried out; but in no instance should the matrix or mold be immersed within the molten material for a long enough time to allow its temperature to be raised sufficiently to permit the deposited molten material thereon to become remelted. The reduced temperature of the matrix or mold relative to the temperature of the molten material causes the latter to become coagulated or chilled on the interior of the matrix and to deposit thereon to the thickness desired. This chilling also makes the outer surface of the resulting duplicates much smoother than is the case with duplicates made by a mechanical duplicating process. Owing to the thinness of the walls of the receptacle 8 the metal thereof very quickly attains the temperature of the molten material, so that none of the molten material will accumulate thereon. It will be understood that the matrix or mold may be made of increased thickness or be artificially cooled before the dipping operation when the composition is of a character requiring an increased cooling effect to secure the desired thickness of deposit. When the desired deposit of molten material is secured, the receptacle 8 is removed from the bath of molten material and the disk 3, carrying the mold, is removed from said receptacle. Obviously the lower edge of the resulting duplicate will be perfectly true, being formed by the portion of the disk 3 between the opening 6 and the bore of the matrix or mold, and if a representation 7 is formed on that portion of the disk such representation will be cast in the bottom end of the duplicate. The cap 2 is now removed from

the matrix or mold and the upper end of the duplicate is trimmed off flush with the upper surface of the matrix or mold by any desired form of cutting-tool. The matrix or mold, which has a slightly-tapered outer surface, is now placed in a tapered chuck 13, as shown in Fig. 2, which chuck is provided with a water-jacket 14, through which cold water may circulate in order that the matrix or mold may be kept cold enough to maintain the resulting duplicate or at least the outer surface thereof in a chilled and hardened condition. The chuck 13 being rotated in any suitable way, a reaming-tool 15, held at an angle to give the desired taper to the bore of the duplicate, is introduced within the same, and by reason of the cut-away portions 16 in said reaming-tool a series of ribs will be formed on the duplicate, as shown in Fig. 4, by which the latter will be properly held upon the mandrel of the reproducing-phonograph in the usual way. The reaming-tool 15 is carried by the usual slide-head 17 of the lathe, and the depth of cut of said tool is limited by a regulating-screw 18, as shown. This reaming of the interior of the duplicate is preferably carried on before the resulting duplicate has cooled sufficiently to become hard and before it has contracted from the bore of the matrix, whereby the reaming operation can be carried on effectively and smoothly. After the interior of the duplicate has been properly reamed, as explained, the matrix or mold is removed from the chuck 13 and inserted in a cooling-mold 19, having a water-jacket 20 and through which cold water may circulate, the matrix or mold being kept in the cooling-mold until the resulting duplicate has contracted sufficiently to enable it to be removed from the matrix or mold, whereupon the operation will be completed. By reaming the interior of the resulting duplicates, as explained, to form a series of ribs therein the duplicates may be made much thinner than the ordinary original records, and hence more economically, it being of course understood that the material removed by the reaming-tool will be used for the manufacture of subsequent duplicates.

While our improved process is particularly adapted for the manufacture of duplicate records, it will be understood that the process may be carried out in connection with the manufacture of phonograph-blanks by employing a matrix or mold having a smooth bore, in which a deposit may accumulate by a process of immersion, as described. The deposited blank will be reamed on its interior, trimmed on its outer edge, and removed by shrinking or otherwise in exactly the same way as that described in connection with the manufacture of duplicate records. Such a process not only provides for the cheap and effective manufacture of phonograph-blanks, but by its carrying out a superior article is produced since the record-surface of the

blanks will be smooth and calendered in appearance. With such blanks therefore after having received a record in any suitable way the reproduction will be smoother and freer of extraneous sounds than reproductions obtained from records made on other blanks.

We do not claim herein the apparatus above described for carrying our invention into effect, since such apparatus is made the subject of our companion application filed on even date herewith and numbered serially 25,392.

Having now described our invention, what we claim as new, and desire to secure by Letters Patent, is as follows:

1. The method of making a cylindrical phonographic surface, which consists in immersing a continuous tubular mold in a molten wax-like coagulable material, whereby the material will accumulate on the bore of the mold and will chill thereon in a layer of the desired thickness, then in contracting the deposited material, and finally in removing it longitudinally from the mold, substantially as set forth.

2. The method of duplicating phonographic records, which consists in immersing a continuous cylindrical mold or matrix carrying the record in relief on its bore in a molten wax-like coagulable material, whereby the material will accumulate on the bore of the matrix or mold and chill thereon in a layer of the desired thickness, then in contracting the deposited material, and finally in removing it by a direct longitudinal movement from the matrix or mold, substantially as set forth.

3. The method of duplicating phonographic records, which consists in immersing a mold or matrix carrying the record in relief on its bore in a molten wax-like coagulable material, whereby the material will accumulate on the bore of the matrix or mold and chill thereon in a layer of the desired thickness, in finishing the bore of the duplicate so secured, and in separating the duplicate from the matrix or mold, substantially as set forth.

4. The method of duplicating phonographic records, which consists in immersing a mold or matrix carrying the record in relief on its bore in a molten wax-like coagulable material, whereby the material will accumulate on the bore of the matrix or mold and chill thereon in a layer of the desired thickness, in finishing the bore of the duplicate so se-

cured, and in shrinking the duplicate from the matrix or mold, substantially as set forth.

5. The method of duplicating phonographic records, which consists in immersing a mold or matrix carrying the record in relief on its bore in a molten wax-like coagulable material, whereby the material will accumulate on the bore of the matrix or mold and chill thereon in a layer of the desired thickness, in finishing the bore of the duplicate so secured before the latter has become hard, and in separating the duplicate from the matrix or mold, substantially as set forth.

6. The method of duplicating phonographic records, which consists in immersing a matrix or mold carrying the record in relief on its bore in a molten wax-like coagulable material which is excluded from the exterior of the matrix or mold and only enters the bore thereof, whereby the reduced temperature of the matrix or mold causes the material to chill on the bore and accumulate in a layer of the desired thickness, in removing the matrix or mold from the molten material, in trimming the bore of the duplicate so secured, and in separating the duplicate from the matrix or mold, substantially as set forth.

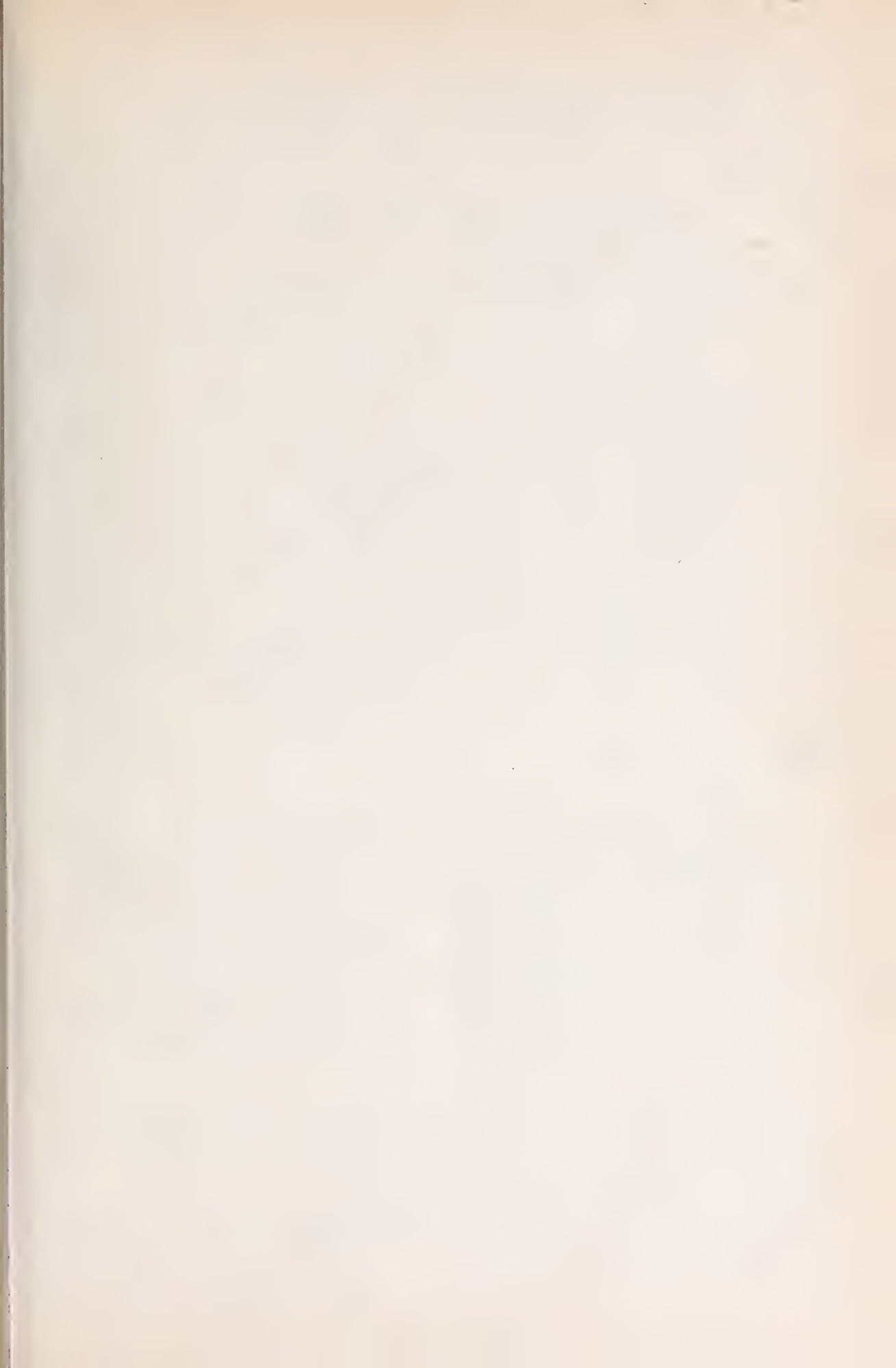
7. The method of duplicating phonographic records, which consists in immersing a matrix or mold carrying the record in relief on its bore in a molten wax-like coagulable material which is excluded from the exterior of the matrix or mold and only enters the bore thereof, whereby the reduced temperature of the matrix or mold causes the material to chill on the bore and accumulate in a layer of the desired thickness, in removing the matrix or mold from the molten material, then in maintaining the reduced temperature of the matrix or mold while the interior of the duplicate is finished, and finally in further reducing the temperature of the matrix or mold to cause the resulting duplicate to be contracted, whereby it may be removed by a direct longitudinal movement, substantially as set forth.

This specification signed and witnessed this 17th day of July, 1900.

WALTER HENRY MILLER.
JONAS WALTER AYLSWORTH.

Witnesses:

J. L. EVANS,
HENRY WACHENFELD.



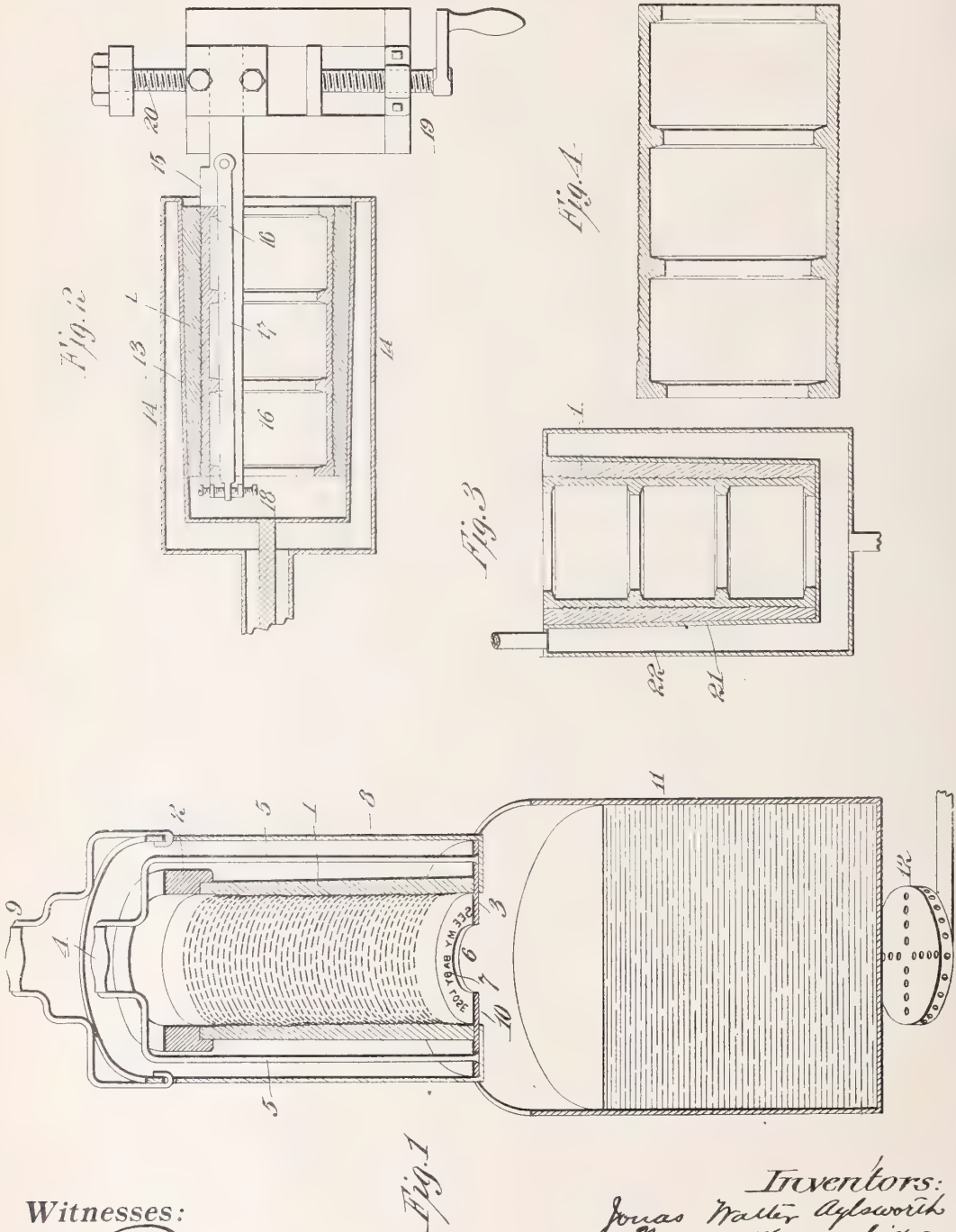
No. 683,676.

Patented Oct. 1, 1901.

J. W. AYLSWORTH & W. H. MILLER.
APPARATUS FOR DUPLICATING PHONOGRAPHIC RECORDS.

(Application filed July 31, 1900.)

(No Model.)



Witnesses:

James Coleman
Geo. R. Taylor

Inventors:
Jonas Walter Aylsworth
Walter Henry Miller

By *Spencer Edmunds & Spence*
Att'ys.

UNITED STATES PATENT OFFICE.

JONAS WALTER AYLSWORTH, OF EAST ORANGE, AND WALTER HENRY MILLER, OF ORANGE, NEW JERSEY, ASSIGNORS TO NATIONAL PHONOGRAPH COMPANY, OF ORANGE, NEW JERSEY.

APPARATUS FOR DUPLICATING PHONOGRAPHIC RECORDS.

SPECIFICATION forming part of Letters Patent No. 683,676, dated October 1, 1901.

Application filed July 31, 1900. Serial No. 25,392. (No model.)

To all whom it may concern:

Be it known that we, JONAS WALTER AYLSWORTH, residing at East Orange, and WALTER HENRY MILLER, residing at Orange, in the county of Essex and State of New Jersey, citizens of the United States, have invented a certain new and useful Apparatus for Duplicating Phonographic Records, of which the following is a specification.

Our invention relates to an improved apparatus for duplicating phonographic records. In an application for Letters Patent filed on even date herewith, and numbered serially 25,391, we describe an improved process or method for duplicating phonographic records, which consists in immersing in a bath of molten wax-like coagulable material a matrix or mold which carries on its bore the representation in negative or relief of the record to be duplicated, whereby the molten material will fill the bore of the matrix or mold, but will be excluded from its exterior, the reduced temperature of the matrix or mold relative to the molten material causing the latter to coagulate or chill upon the bore of the matrix until a layer of the desired thickness has been secured, after which the matrix or mold is removed from the bath of molten material and the bore of the duplicate finished by a reaming-tool, the resulting duplicate being finally removed from the matrix or mold by shrinking.

The object of our present invention is to provide an improved apparatus by which the process in question may be expeditiously carried out.

In order that our invention may be better understood, attention is directed to the accompanying drawings, forming a part of this specification, and in which—

Figure 1 is a sectional view of the apparatus and mold in which the deposit or coating of the wax-like material is secured; Fig. 2, a corresponding view of the apparatus for properly reaming the interior of the duplicates; Fig. 3, a similar view of the apparatus employed for the shrinking of the duplicates from the matrix or mold, and Fig. 4 an enlarged corresponding view of one of the resulting duplicates.

In all of the above views corresponding parts are represented by the same numerals of reference.

1 represents a matrix or mold carrying on its bore the representation of the record which is to be duplicated, said representation being obviously in negative or relief. This matrix or mold is made by any approved process and is not a part of our invention.

2 is a metal cap, which is removably fitted upon the upper end of the matrix or mold, with its bore corresponding in diameter with the bore of the matrix or mold.

3 is a metal disk provided with a handle 4, connected to side bars 5 5 and by which the disk may be manipulated. The matrix or mold 1 is carried by the disk 3, as shown. An opening 6 in the disk 3 is of considerably less diameter than the bore of the matrix or mold, and around said opening 6 and within the bore of the matrix or mold the disk may be formed in negative with a representation of suitable words or characters to indicate the subject-matter of the duplicated record, its source of origin, &c.

8 is a sheet-metal receptacle provided with a handle 9 and which carries the disk 3 and the matrix or mold 1, as shown. The receptacle 8 is provided with an opening 10 therein, which may be of the same or of larger size than the opening 6 in the disk 3.

11 represents a tank, which contains, as indicated, a proper supply of suitable wax-like material from which the duplicates are to be made, and which material may be the ordinary commercial phonographic compositions now in use. The material in the tank 11 may be kept in a molten condition by heat applied in any suitable way, as by means of a gas-burner 12.

In carrying out our process with the apparatus so far described we place the matrix or mold on the disk 3 and insert the latter, carrying the matrix or mold in the receptacle 8, as shown, after which the receptacle 8 is immersed in the molten material within the tank 11, which is permitted to enter the matrix or mold to a point above the upper end of the latter, but below the top of the cap 2, so that the material fills the interior of the matrix or mold, but does not

not overflow the same. The matrix or mold is thus kept immersed in the molten material for the desired time required to secure a deposit of the wax-like material of the required 5 thickness. The reduced temperature of the matrix or mold relative to the temperature of the molten material causes the latter to become coagulated or chilled on the interior of the matrix and to deposit thereon to the 10 thickness desired. This chilling also makes the outer surface of the resulting duplicates much smoother than is the case with duplicates made by a mechanical duplicating process. Owing to the thinness of the walls of 15 the receptacle 8, the metal thereof very quickly attains the temperature of the molten material, so that none of the molten material will accumulate thereon. When the desired deposit of molten material is secured, the receptacle 8 is removed from the bath of molten 20 material and the disk 3, carrying the mold, is removed from said receptacle. Obviously the lower edge of the resulting duplicate will be perfectly true, being formed by the portion of the disk 3 between the opening 6 and 25 the bore of the matrix or mold, and if a representation 7 is formed on that portion of the disk such representation will be cast in the bottom end of the duplicate. The cap 2 is now removed from the matrix or mold and the upper end of the duplicate is trimmed off flush with the upper surface of the matrix or mold by any desired form of cutting-tool. The matrix or mold, which has a slightly- 35 tapered outer surface, is now placed in a tapered chuck 13, as shown in Fig. 2, which chuck is provided with a water-jacket 14, through which cold water may circulate in order that the matrix or mold may be kept 40 cold enough to maintain the resulting duplicate, or at least the outer surface thereof, in a chilled and hardened condition. The chuck 13 being rotated in any suitable way, a reaming-tool 15 is introduced within the same, 45 and by reason of the cut-away portions 16 in said reaming-tool a series of ribs will be formed on the duplicate, as shown in Fig. 4, by which the latter will be properly held upon the mandrel of the reproducing-phonograph 50 in the usual way. The reaming-tool 15 carries on one face an auxiliary cutting-blade 17, as shown, pivoted at one end and adjustable at the other by means of adjusting-screws 18. By changing the inclination of this cutting-blade 17 the depth and taper of the ribs 55 can be regulated with the utmost certainty, so that the record can be accurately fitted to the tapered mandrel of the reproducing instrument. In other words, the ribs which are 60 formed by the cut-away portion 16 of the reaming-tool will by the auxiliary blade 17 be cut to gradually-increasing diameters from one end of the duplicate to the other, so that the duplicate will be frictionally received upon the usual tapered mandrel. The ream- 65 ing-tool 15 is carried by the usual slide-head 19 of the lathe, and the depth of cut of said

tool is limited by a regulating-screw 20, as shown. After the interior of the duplicate has been properly reamed, as explained, the 70 matrix or mold is removed from the chuck 13 and inserted in a cooling-mold 21, having a water-jacket 22, and through which cold water may circulate, the matrix or mold being kept in the cooling-mold until the result- 75 ing duplicate has contracted sufficiently to enable it to be removed from the matrix or mold, whereupon the operation will be completed. By reaming the interior of the resulting duplicates, as explained, to form a series of ribs therein the duplicates may be 80 made much thinner than the ordinary original records, and hence more economically, it being of course understood that the material removed by the reaming-tool will be used for 85 the manufacture of subsequent duplicates.

Having now described our invention, what we claim as new, and desire to secure by Letters Patent, is as follows:

1. An improved apparatus for duplicating 90 phonographic records, comprising a receptacle carrying a matrix or mold, the latter having the record in relief on its bore, and an opening in said receptacle concentric with the bore of the matrix or mold, whereby the 95 receptacle with the matrix or mold may be immersed in a bath of molten, wax-like material to fill the bore of the matrix or mold but to be excluded from its exterior, substantially as set forth. 100

2. An improved apparatus for duplicating 105 phonographic records, comprising a receptacle having an opening in its bottom, a disk carried by the receptacle and having a corresponding opening, and a matrix or mold seated upon said disk with its bore concentric 110 with the opening therein, whereby the receptacle with the matrix or mold may be immersed in a bath of molten, wax-like material to fill the bore of the matrix or mold but to be excluded from its exterior, substantially as set forth.

3. An improved apparatus for duplicating 115 phonographic records, comprising a receptacle having an opening in its bottom, a disk carried by the receptacle and having a corresponding opening, and a matrix or mold seated upon said disk with its bore concentric with the opening therein, whereby the 120 receptacle with the matrix or mold may be immersed in a bath of molten, wax-like material to fill the bore of the matrix or mold but to be excluded from its exterior, the disk being provided between the opening therein and the bore of the matrix or mold with a 125 representation to be molded upon the end of the desired duplicates, substantially as set forth.

4. An improved apparatus for duplicating 130 phonographic records, comprising a receptacle having an opening in its bottom, a matrix or mold seated over said opening and carrying on its bore the representation in relief of the record to be duplicated, and a re-

movable cap carried by the upper end of the matrix or mold, whereby by immersing the receptacle in a bath of molten material the latter may enter the bore of the matrix or mold above the upper end thereof without overflowing to contact with its exterior, substantially as set forth.

5. An improved apparatus for making duplicate phonographic records, comprising a matrix or mold carrying on its bore the representation of the record to be duplicated, a disk upon which said matrix or mold is seated, said disk carrying concentrically within the bore of the matrix or mold a designation of such record, and means for depositing molten material within the matrix or mold and upon said disk, whereby the duplicate record will be formed and its designation be simultaneously cast or impressed upon the end thereof, substantially as and for the purposes set forth.

6. An improved apparatus for duplicating phonographic records, comprising the combination with means for securing a deposit of a wax-like coagulable material upon the bore

of a matrix or mold which carries the representation of the record to be duplicated, of means for finishing the interior of the duplicate while the latter is in position within the matrix or mold, substantially as set forth. 30

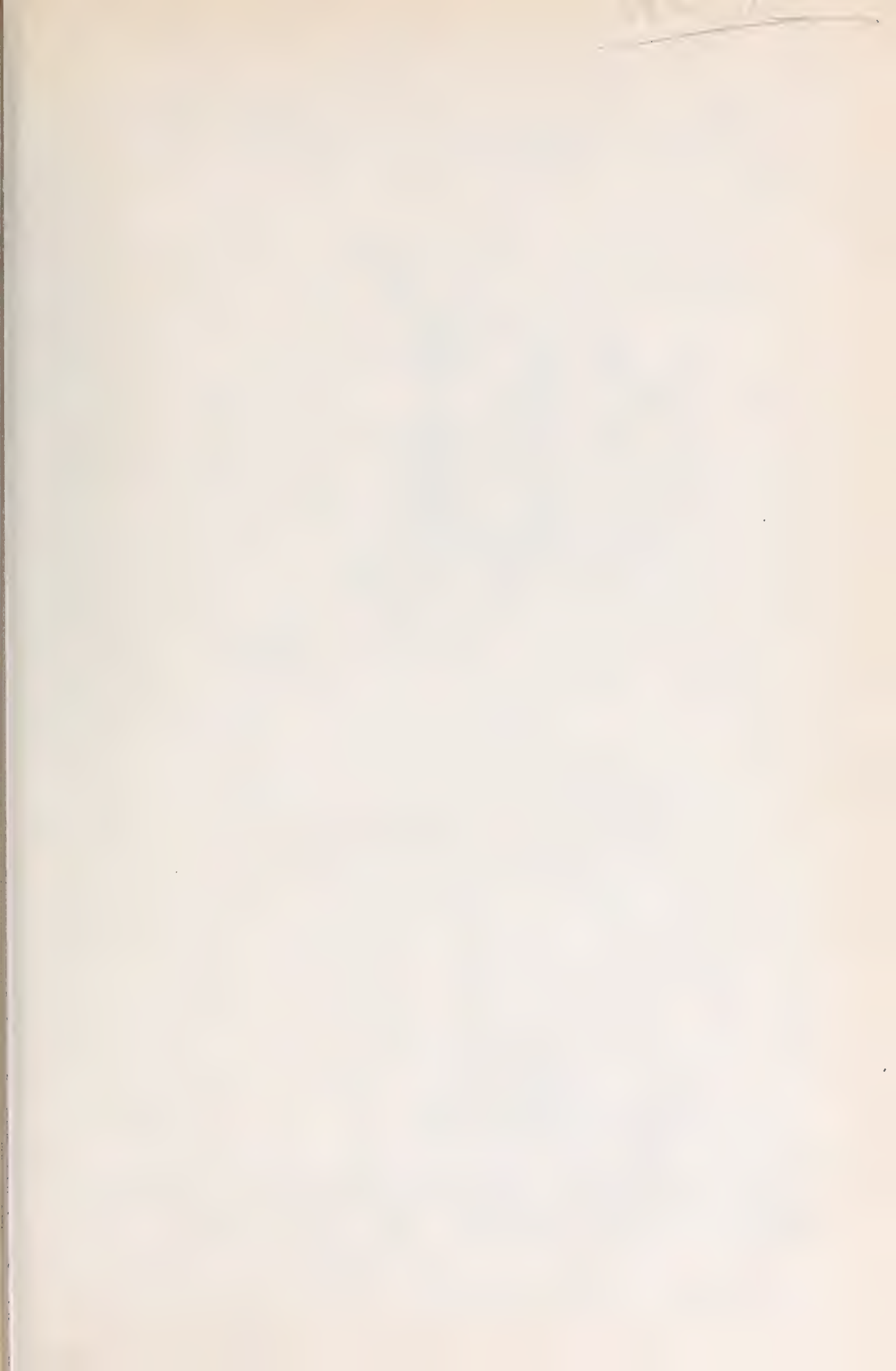
7. An improved apparatus for duplicating phonographic records, comprising the combination with means for securing a deposit of a wax-like coagulable material upon the bore of a matrix or mold which carries the representation of the record to be duplicated, of means for forming within the duplicate while the latter is in position in the mold a series of concentric ribs of gradually-increasing diameters from one end of the duplicate to the other, whereby the duplicate may be properly received upon a tapered mandrel, substantially as set forth. 35 40

This specification signed and witnessed this 17th day of July, 1900.

JONAS WALTER AYLSWORTH.
WALTER HENRY MILLER.

Witnesses:

JOS. EVANS,
ELIZABETH EVANS.



No. 683,712.

Patented Oct. 1, 1901.

T. H. STEVENS.

CARRIAGE TRAVELING GEAR FOR PHONOGRAPH MACHINES.

(Application filed Mar. 23, 1901.)

(No Model.)

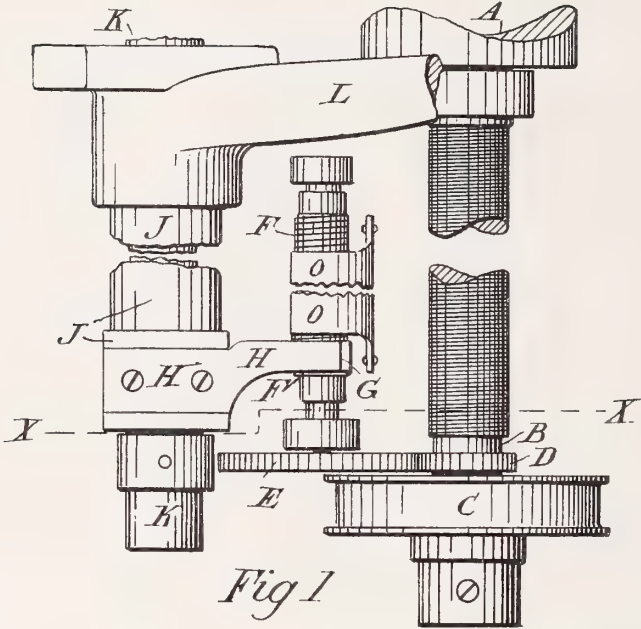


Fig 1

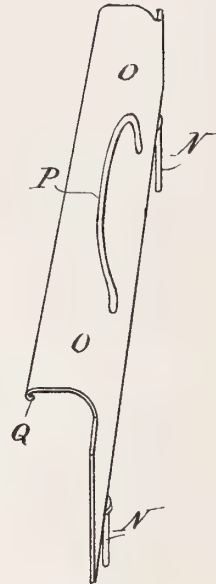


Fig 4

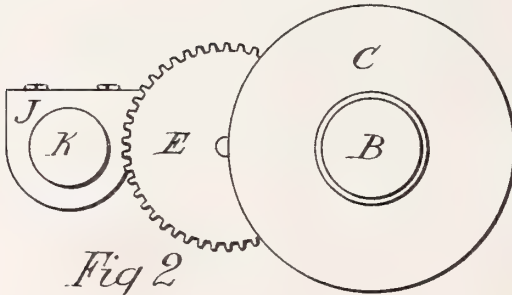


Fig 2

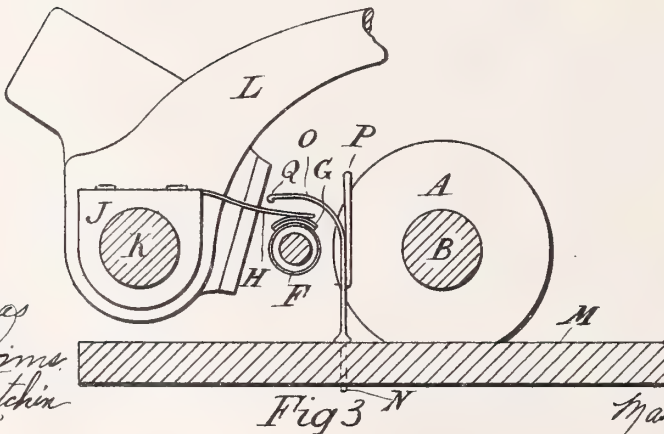


Fig 3

Witnesses
A. C. Sims
E. M. Ritchie

Inventor
Thomas Henry Stevens
by his attorney
Maximilian K. Lawrence

UNITED STATES PATENT OFFICE.

THOMAS HENRY STEVENS, OF EAST ST. KILDA, VICTORIA.

CARRIAGE TRAVELING GEAR FOR PHONOGRAPH-MACHINES.

SPECIFICATION forming part of Letters Patent No. 683,712, dated October 1, 1901.

Application filed March 23, 1901. Serial No. 52,601. (No model.)

To all whom it may concern:

Be it known that I, THOMAS HENRY STEVENS, showman, a subject of the King of Great Britain and Ireland, residing at 301 Inkerman street, East St. Kilda, in the county of Bourke, State of Victoria, Commonwealth of Australia, have invented certain new and useful Improvements in the Carriage Traveling Gear of Phonograph-Machines, of which the following is a specification.

The object of my invention is to provide a traveling gear for the carriage of phonographs which shall cause the operator but little trouble and shall produce a better result.

In some of the machines in use I have found the rotating thread which operated the carriage was too fine and therefore too delicate. It harbored dust. Even if only in the finest particles this dust gathered on the screw and could only be removed by the closest of care and watchfulness. Unless this was done an imperfect contact was thereby made with the part-nut which jumped. This interfered with the quality of the reproduction from the record and materially affected the clearness and volume of the delivery; but with my invention by the aid of a dust-shield protecting a greater portion of the screw and the introduction of an intermediate shaft permitting the use of a coarser thread a better, a less ragged, and less interrupted tone is emitted, which is far more agreeable and natural, and therefore intelligible to the human ear.

My invention consists of a dust-shield extending over the feed-screw of a carriage traveling gear for phonographs from one side of said screw, an arm extending under said shield and over said screw from the other side thereof, a half-nut carried by the arm and engaging the screw, the said arm being connected with and moving the carriage of the machine.

Referring to the drawings which form a part of this specification, Figure 1 represents a plan of the traveling gear, which is broken through the middle for the convenience of illustration. Portions of the record-holding cylinder and the carriage-arm above it are seen. Fig. 2 is an end elevation looking at the outside end of the parts. Fig. 3 is a vertical section through X X, Fig. 1. Fig. 4 is a perspective view of the dust-shield.

Similar letters of reference indicate similar or corresponding parts where they occur in the several views.

On reference to the drawings it will be seen that A is the record-holding cylinder, and B the record-shaft. This is rotated by the belt-pulley C. Upon the shaft B is a pinion D, which gears into a wheel E upon the combination intermediate shaft and screw-thread F. Upon the top of this combination intermediate shaft and screw-thread rests the part-nut G. The part-nut G is secured to the nut-arm H on the sleeve J, which sleeve travels longitudinally upon the rod K. On the end of the sleeve J is the carriage-arm L, which overhangs the record.

Through the bed of the frame M are made holes to accommodate the protuberances N on the bottom edge of the dust-shield O. This shield has clearance portions removed at each end to permit of the arm (when the carriage is at the extremity of its travel at either end) to be lifted. In section the dust-shield somewhat resembles the letter L inverted. A handle P enables it to be lifted for the occasional cleansing of the thread and the part-nut. The depending lip Q of the dust-shield, as seen in Fig. 3, is sufficiently high above the nut-arm H to permit the said arm by catching hold of the carriage being partially lifted off the record. When this is done, the sleeve and nut-arm and part-nut can be moved longitudinally until the said nut-arm is at either extremity of its travel, where it reaches the clearance portions and can be lifted right back through the said portions.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a carriage traveling gear for phonograph-machines, the combination with a feed-screw shaft of a dust-shield extending over the said screw from one side thereof, an arm extending under said shield and over the said screw from the other side thereof, a half-nut carried by the arm and engaging the screw, the said arm being connected with and moving the carriage of the machine, substantially as described.

2. The improvement in the carriage traveling gear of phonograph-machines consisting of a dust-shield of the section of an inverted

L having a lifting-handle thereon, depending lip, clearance portions at each end and protuberances on the bottom edge falling into holes to accommodate same in the bed of the machine all as and for the purposes hereinbefore described and as illustrated in the drawings.

3. In a carriage traveling mechanism for phonograph-machines, the combination with a record-shaft of a carriage-shaft arranged parallel therewith, a feeding-screw located between the record-shaft and the carriage-shaft, an arm engaging the screw and projecting laterally therefrom for moving the machine-carriage and a shield mounted on the

machine and extending upwardly between the record-shaft and the feed-screw, the said shield being bent over the feed-screw for excluding dust therefrom, the arrangement of the shield being such that it will not interfere with the movement of the carriage-actuating arm, substantially as described.

In witness whereof I have hereunto set my hand to this specification in the presence of two witnesses.

THOMAS HENRY STEVENS.

Witnesses:

EDWIN PHILLIPS,

CECIL W. LE PLASTRIER.

METHOD OF MAKING DUPLICATE SOUND RECORDS.

(Application filed Nov. 28, 1900.)

(No Model.)

2 Sheets—Sheet 1.

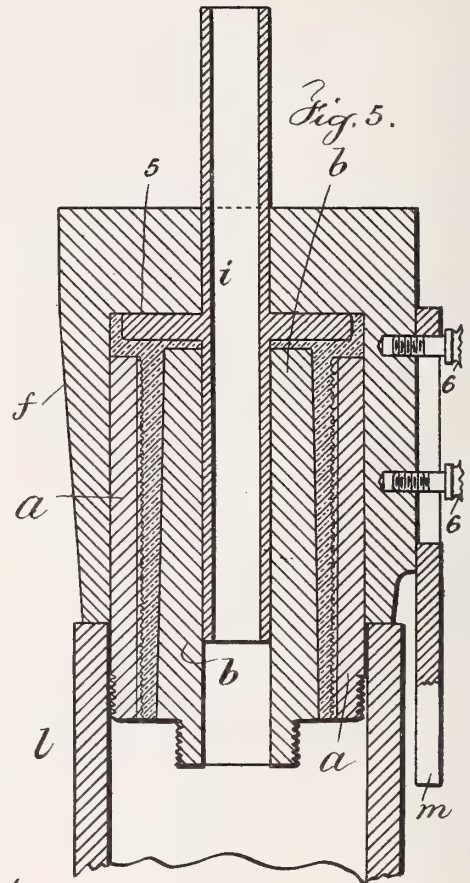
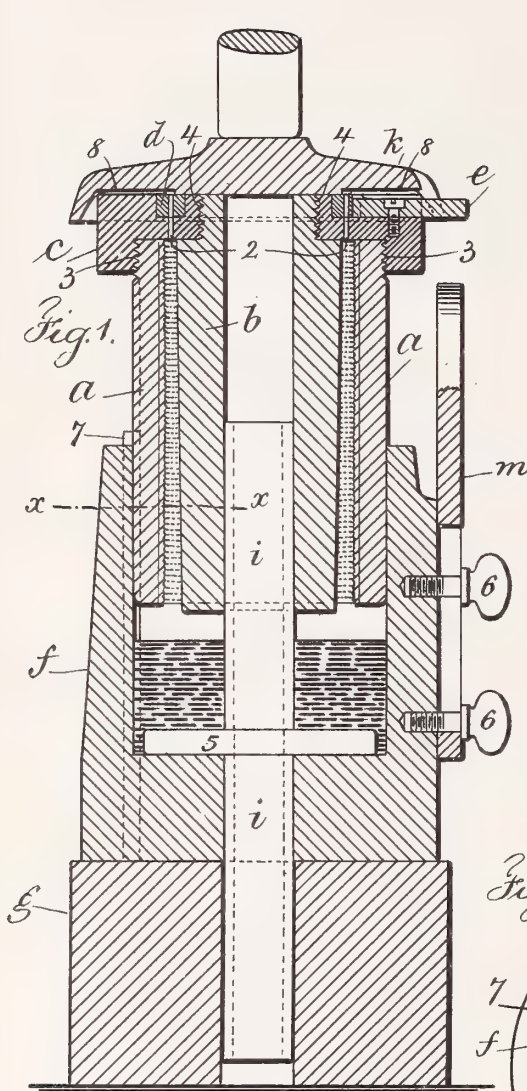


Fig. 4.

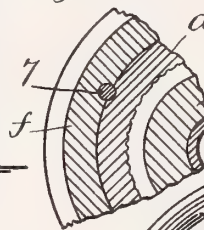
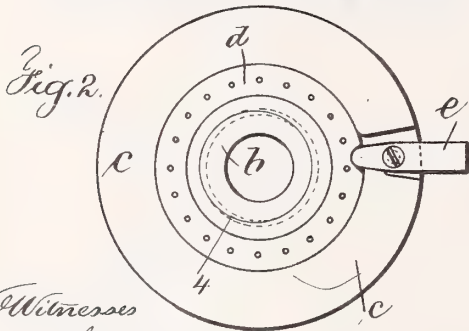
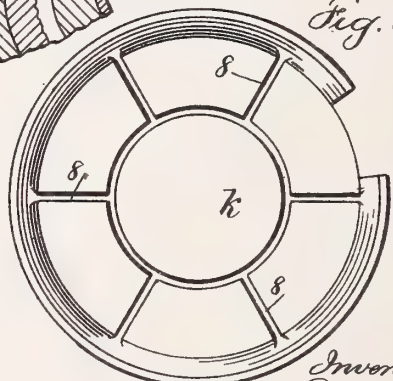


Fig. 3.



Witnesses
Charles Smith
J. Stail

Inventor
Adenor N. Petit
J. W. Perrell & Son atty



No. 683,862.

Patented Oct. 1, 1901.

A. N. PETIT.

METHOD OF MAKING DUPLICATE SOUND RECORDS.

(Application filed Nov. 28, 1900.)

(No Model.)

2 Sheets—Sheet 2.

Fig. 6.

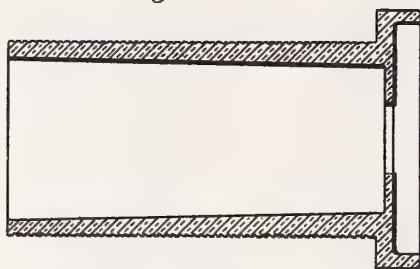
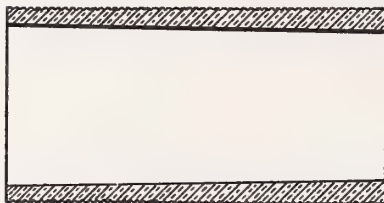


Fig. 7.



Witnesses

Chas. H. Smith
J. Staib

Inventor

Ademor N. Petit.

For *L. W. Terrell & Son*

attys

UNITED STATES PATENT OFFICE.

ADEMOR N. PETIT, OF NEWARK, NEW JERSEY, ASSIGNOR TO HIMSELF AND
ALBERT O. PETIT, OF SAME PLACE.

METHOD OF MAKING DUPLICATE SOUND-RECORDS.

SPECIFICATION forming part of Letters Patent No. 683,862, dated October 1, 1901.

Application filed November 28, 1900. Serial No. 37,992. (No specimens.)

To all whom it may concern:

Be it known that I, ADEMOR N. PETIT, a citizen of the United States, residing at Newark, in the county of Essex and State of New Jersey, have invented an Improvement in Methods of Making Duplicate Sound-Record Cylinders, of which the following is a specification.

Heretofore phonogram-blanks of wax composition have been cast and thereafter trued with heated tools and the record of sound afterward engraved or cut thereon and matrices of such sound-records have been formed and duplicate records made therefrom.

My invention relates to the method of making a duplicate sound-record cylinder; and in carrying out my invention I employ a matrix-body—that is to say, a matrix of a sound-record made and backed up in substantial shape in any manner well known in the art, a hollow-core device to which the same is removably connected, a perforated hollow base and a tubular center received within the core and base, and means for forcing the matrix and core down into the base and causing composition material rendered fluid by heat and held in said hollow base to flow upward between the matrix and core under pressure to fill the interstices of the matrix and when set, cooled, and removed to form the duplicate sound-record. I also provide means for the escape of the confined air and thereafter of a small quantity of the fluid composition to prove the absence of the air and which means are closed or shut off before final pressure is applied to consolidate the composition material in forming the duplicate record and compel the composition to fill all the delicate portions of the matrix. I also provide means for cooling the duplicate sound-record from inside and means for thereafter removing the core to liberate the duplicate record from the matrix.

In the drawings, Figure 1 is a vertical section and partial elevation representing my improvement. Fig. 2 is a plan of the head portion connecting the matrix and the hollow core together with the devices connected thereto for permitting the escape of the air. Fig. 3 is an inverted plan of the pressure-cap of the press. Fig. 4 is a partial sectional plan

at $x x$ of Fig. 1, showing a guide-pin between the hollow base and the matrix to insure the vertical movement of the parts with reference to one another. Fig. 5 is a vertical section illustrating the removal of the duplicate record-core and matrix from the hollow base. Fig. 6 is a longitudinal section of the duplicate record as removed from the core and matrix, and Fig. 7 is a longitudinal section of the completed duplicate record.

The matrix or body a is prepared in any manner well known in the art. One end of the body is provided with a peripheral screw-thread.

b represents the hollow core, preferably tapering and agreeing in dimensions with the mandrel of a phonograph or record-reproducing machine. One end of this hollow core is reduced and provided with a peripheral screw-thread. The head c is provided with perforations 2 and with annular screw-surfaces 3 4, the hollow core b screwing to the head at the screw-surface 4 and the matrix screwing to the head at the screw-surface 3. In this manner the matrix and the hollow core are connected together and maintained at a distance apart, the annular cavity between the same agreeing approximately with the finished duplicate record.

In the upper surface of the head c I provide a ring d with perforations, and the said ring d is provided with a notched or cut-away portion for the swinging arm e , pivoted to the head and provided with a rounded end adjacent to the ring d and bearing in a recess in said ring. In the normal position of the ring the head and the swinging arm e in the position shown in Figs. 1 and 2, the perforations 2 in the head, and the perforations in the ring d coincide; but when the arm e is moved to turn the ring d slightly the respective perforations are thrown out of alinement and the openings cut off.

I provide a hollow base f , adapted to receive closely within the same the matrix-body, and a guide-pin 7 (see especially Figs. 1 and 4) is inserted in a groove in the hollow base and bears in a groove in the matrix-body, so as to compel the matrix to move vertically in the hollow base. This hollow base is preferably put upon a pedestal g , having

an opening in the center, and I provide a tube *i*, forming a center, a part of which passes through the opening in the hollow base *f* into the opening in the pedestal and the other end of which extends upward into the opening in the hollow core *b*, and upon this tube *i* is a disk 5, normally lying adjacent to the bottom of the hollow base.

k represents the cap of a press, to which power can be applied.

m represents a cam-arm slotted and adjustable and connected vertically upon one side of the hollow base by clamp-screws 6. The upper end of this arm is beveled to act as a cam against the end of the swinging arm *e* as the matrix and hollow core are forced downward into the hollow base.

The under surface of the cap *k* is preferably provided with annular and radial grooves 8.

I have shown in Fig. 1 by dark lines in the bottom of the hollow base a composition rendered fluid by heat. This may be effected either by heating the hollow base *f* in any suitable manner or by pouring the material into the base sufficiently hot to enable the operations to be effected. After this material is put into the hollow base and with the perforations in the head *c* and in the ring *d* in line pressure is applied to the cap *k* to force the matrix-body and the hollow core *d* down into the base *f*. In this movement the air passes out of the perforations in the head and ring and escapes by the annular and radial grooves 8 in the cap *k*, and the composition in a fluid state rises between the matrix and the hollow core, fills the space therein, and some of the composition even escapes by the perforations in the head and ring. As these parts arrive at this position in the downward movement the cam *m* strikes and swings the arm *e*, turning the ring *d* and moving the perforations out of alinement and cutting off the composition, so that the same is held within the mold, and the further downward movement by pressure of the matrix and core consolidates the fluid composition material into a compact mass, compelling the same to fill all the fine interstices of the matrix. The parts are then allowed to stand until the composition is partially set, and water is then by preference passed through the tube *i* to cool the hollow core *b* and chill the composition material, cooling the same from the inside outward. When the composition has become sufficiently cooled, the pressure-cap having been removed, I then unscrew the head *c* from the hollow core and matrix-body. This is readily accomplished, because the two screw-threads are cut in the same direction and the threads agree. Consequently when the head is rotated it comes away from the hollow core and matrix-body at the same time without disturbing the duplicate record. In unscrewing the head *c* it becomes necessary to move the cam-arm *m* out of the path of the swinging arm *e*; otherwise the cam-arm would interfere with the rotation of the head *c*. This

is provided for by the slotted construction of the cam-arm and the set-screws, by which the same is held to the hollow base, these screws being loosened and the cam-arm dropped the length of the slot, which, it will be found, would move the same out of the path of the arm *e* when the head is rotated. The hollow base, core, matrix, and composition, with the tube *i*, are moved away from the pedestal *g* and turned upside down, with the end projecting into a ring *l*, resting upon a suitable base. Pressure is then applied to the upper end of the tube *i* to force the same downward, and as the disk 5 is larger than the core and the duplicate record and of almost the diameter of the matrix-body the same is employed to press the hollow core, matrix, and duplicate record out of the hollow base *f*. When these parts have been separated from the hollow base, it will usually be found that the duplicate record has contracted with the cooling sufficiently to allow the hollow core *b* to be readily removed from within the duplicate record and the record itself to be backed out of or removed from the matrix. One end of the duplicate record—that is, the end adjacent to the position of the head *c*—will be substantially in a finished condition. The flanges at the opposite end that in making the record came between the face of the disk 5 and the ends of the matrix and hollow core are readily removed by turning the same down in a lathe or in any other suitable manner.

I do not limit myself to the composition material rendered fluid by heat and employed for making the duplicate sound-record, but would remark that composition of a harder and tougher nature than the well-known waxy compositions can be readily employed for this purpose.

I claim as my invention—

1. The method herein specified of making duplicate sound-record cylinders consisting in forcing a composition material, rendered fluid by heat, into a matrix-mold and simultaneously permitting the air to escape after the composition enters, cutting off the escape when the mold is filled, then applying pressure to solidify and render dense the composition material in the mold, substantially as specified.

2. The method herein specified of making duplicate sound-record cylinders consisting in forcing a connected but spaced-apart matrix and hollow core down into a hollow base containing composition material rendered fluid by heat, forcing the same up into the annular recess between the matrix and the hollow core, permitting the air to escape therefrom as the composition advances, cutting off the air as the composition reaches the end of the annular recess and applying pressure to consolidate the composition and force the same into the interstices of the matrix, substantially as set forth.

3. The method herein specified of making duplicate sound-record cylinders, consisting

in forcing a connected but spaced-apart matrix and hollow core down into a hollow base containing composition material rendered fluid by heat, forcing the same up into the
 5 annular recess between the matrix and the hollow core, permitting the air to escape therefrom as the composition advances, cutting off the air as the composition reaches the end of the annular recess and applying
 10 pressure to consolidate the composition and force the same into the interstices of the matrix, cooling the hollow core and the duplicate record from within outward, and thereafter separating the duplicate record from
 15 the matrix and the hollow core by forcing the same out of the hollow base and separating the same thereafter from the matrix and hollow core, substantially as set forth.

4. The method herein specified of forming
 20 duplicate sound-record cylinders, consisting in taking a matrix of a sound-record, connecting the same to a suitable support, taking a hollow core concentric to the matrix, connecting the same to the device supporting
 25 the matrix so that between the core and the matrix there is an annular recess represent-

ing the duplicate record, placing composition rendered fluid by heat in a suitable receptacle, forcing the matrix and hollow core down into the receptacle to cause the composition
 30 to flow up into the annular recess, permitting the air to escape as the composition advances, shutting off the escape of air or composition when the same reaches the end of the recess, applying further pressure to consolidate the
 35 composition and cause the same to fill all the interstices of the matrix, applying water to the inside of the core to cool the same and the matrix from within outward, removing the common support to the matrix and hol-
 40 low core, turning the parts over upon a ring-like support, and applying pressure to force the core, matrix and duplicate record out of the base and thereafter separating the duplicate record as cooled, substantially as set
 45 forth.

Signed by me this 20th day of November, 1900.

ADEMOR N. PETIT.

Witnesses:

GEO. T. PINCKNEY,
 S. T. HAVILAND.

No. 683,958.

Patented Oct. 8, 1901.

T. H. MACDONALD.
SOUND RECORD.

(Application filed Aug. 23, 1898.)

(No Model.)

Fig. 1.

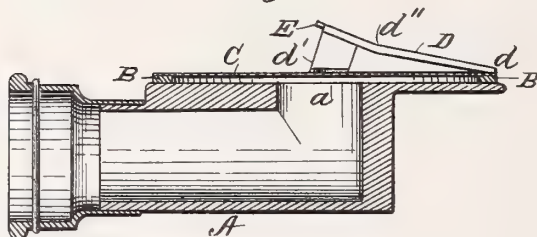


Fig. 2.

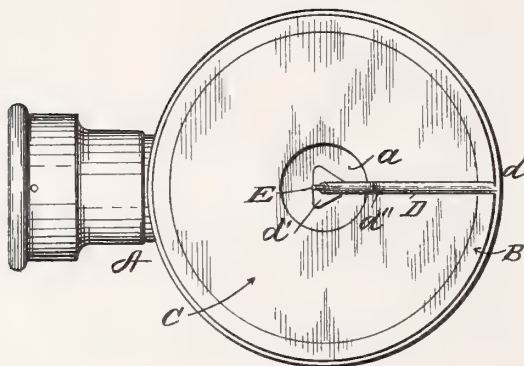
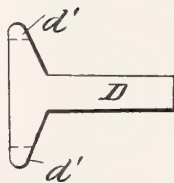


Fig. 3.



Witnesses

H. R. Edelin.

J. T. Cameron

Inventor

Thomas H. Macdonald.

by J. Woodman
his attorney.

UNITED STATES PATENT OFFICE.

THOMAS H. MACDONALD, OF BRIDGEPORT, CONNECTICUT, ASSIGNOR TO
THE AMERICAN GRAPHOPHONE COMPANY, OF WEST VIRGINIA.

SOUND-RECORD.

SPECIFICATION forming part of Letters Patent No. 683,958, dated October 8, 1901.

Application filed August 23, 1898. Serial No. 689,352. (No model.)

To all whom it may concern:

Be it known that I, THOMAS H. MACDONALD, of Bridgeport, Connecticut, have invented a new and useful Improvement in Sound-Recorders, which improvement is fully set forth in the following specification.

My invention relates to improvements in graphophones or phonographs, and more particularly to the recorder of the type shown in United States Letters Patent No. 527,755, granted to me October 16, 1894. Its object is to provide a recorder that is simpler in form, cheaper in construction, and that produces better results than heretofore attained.

In the recorder now in use the diaphragm is held between the main body or "head" of the recorder and an annulus screwed into it, there being gaskets on each side of the diaphragm. An objection to this construction is that if there be any irregularity in the screw-threads or if the diaphragm be not of exactly the same thickness at every part of its margin or if there be any irregularity in the adjacent faces of the head and the annulus there will be an unequally-distributed strain or tension on the diaphragm. The results of this unequal distribution of strain are that the diaphragm (usually of glass) is more liable to break and the vibrations transmitted to the stylus do not correspond with entire accuracy to the sound impulses impinging upon the diaphragm, because the strain on the diaphragm interferes with its freedom of movement, and particularly when the diaphragm is held tighter at one portion of its circumference than at another the vibrations are distorted and nodes are produced. One object of my present invention is to avoid this objection by doing away with this strain, which purpose I accomplish by discarding the annulus referred to and securing the diaphragm directly to a gasket, preferably of rubber, that is itself secured to the flat surface of the head, in a manner herein-after to be described. This construction, involving, as it does, fewer parts, renders the recorder simpler and lighter, besides overcoming the objections already noted. Again, in the recorder now in use the point of the stylus is held by a clamp, which is fastened only to the center of the diaphragm; but neces-

sarily the wings or flanges of the said clamp that are cemented to the diaphragm spread out, so that they cover a comparatively large portion of its surface. The stylus in such a construction may be regarded as a projection, stud, or post rising from the center of the diaphragm, but with the disadvantage of an extended base, which interferes with the buckling of the diaphragm, and besides acts as a damper, deadening the sound more or less. My present invention is an improvement over this old construction in two respects—first, in providing a stylus in the form of a lever, one end attached to the margin of the diaphragm (where the latter is substantially rigid) and the other end attached to the center of the diaphragm, (where it has the maximum mobility,) which allows a greater range of travel to the stylus-point, and, second, in making the wings or flanges of the clamp smaller, so that this point of attachment approximates more nearly a geometrical point, not interfering so much with the freedom and accuracy of vibration of the diaphragm and not dampening the sounds.

In the accompanying drawings, Figure 1 is a longitudinal vertical section, and Fig. 2 a plan view, of my new recorder inverted. Fig. 3 is a detail showing the blank used to form the clamp that holds the stylus-point.

The main portion or head A of the recorder is of the same general form as seen in my Patent No. 527,755, having the passage-way *a* from the center of the flat surface of the head through the rear end thereof.

B indicates a ring, of yielding material, preferably of rubber.

C is the diaphragm.

D is the arm or lever, carrying the cutting-point E and attached at one end to the margin of the diaphragm at *d* and at the other end to the center of the diaphragm, opposite to the entrance of passage-way *a*, at *d'*.

The ring B is covered with cement (stratena) and then attached to the margin of the flat surface of the head, after which the diaphragm is placed lightly upon the ring and allowed to settle down into place by its own weight. This entirely prevents any strain or twisting whatever.

The blank shown in Fig. 3 is formed into a

tube and clamped firmly around the cutting-point at the end containing the flanges. The flanges are bent down and their extremities bent outward to form feet d' d' . The arm D thus formed is bent downward slightly at d'' , so as to present the stylus to the blank-cylinder at the proper angle, and finally the arm D is cemented to the diaphragm at d' d' , as described. Inasmuch as the arm D is attached to the diaphragm at both ends, the feet d' d' may be far smaller than if they were the only means of attachment. This presents the twofold advantage of not interfering with the buckling action of the diaphragm when in vibration and of not acting as a damper.

The advantages of my present invention are that the diaphragm has fuller and freer vibrations and is not liable to break; that the cutting-point has a greater range of vibration, more nearly at right angles to the diaphragm and more nearly normal to the surface of the blank-cylinder; that it cuts a deeper record; that the recorder as a whole, besides being simpler and cheaper, is far lighter, which in this art is recognized as a great desideratum, and that the record engraved in the tablet corresponds more nearly than heretofore to the actual form of the sound-waves.

The reproduction of a sound-record made by my new recorder is clearer, louder, and more accurate than was heretofore attainable.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. In a sound-recorder, a head or support having a flat face, a sound-duct leading therefrom, a diaphragm cemented at its margin to said face opposite said duct, and a recording device carried by said diaphragm upon its outer face, substantially as described.

2. In a sound-recorder, the head or support, and the diaphragm therefor, the latter attached all around its margin directly to the flat face of said head by a continuous yielding support, substantially as described.

3. In a sound-recorder, a head or support inclosing a tubular passage terminating in a chamber, and a diaphragm attached to said

head by a yielding medium to completely inclose said chamber, substantially as described.

4. In a sound-recorder a head or support, a diaphragm, and a ring of yielding material interposed between the face of the head or support and the diaphragm and cemented to both, substantially as described.

5. In a sound-recorder a head or support, a diaphragm, and a rubber ring interposed between the face of the head or support and the diaphragm and cemented to both, substantially as described.

6. In a sound-recorder a cutting-point mounted in a lever which is attached to the diaphragm substantially at its center and at its circumference, substantially as described.

7. In a sound-recorder a bent or elbow lever having one end secured to the diaphragm near its center and the other end secured near its margin, and the cutting-point held at the bend or elbow, substantially as described.

8. In a sound-recorder, a diaphragm, and a stylus supported solely thereby upon one side thereof, in combination with a head or support to which said diaphragm (with its said stylus) is secured solely at its opposite side, substantially as described.

9. A sound-recorder comprising a head or support, a diaphragm secured by an elastic medium at the edge of one of its sides to said head or support but unattached on its opposite side, and a recording-stylus attached to said opposite side of the diaphragm, substantially as described.

10. A sound-recorder comprising a head or support, a diaphragm carrying a stylus and a ring of yielding material cemented on one side to said head and on the other to the edge of said diaphragm, substantially as described.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

THOMAS H. MACDONALD.

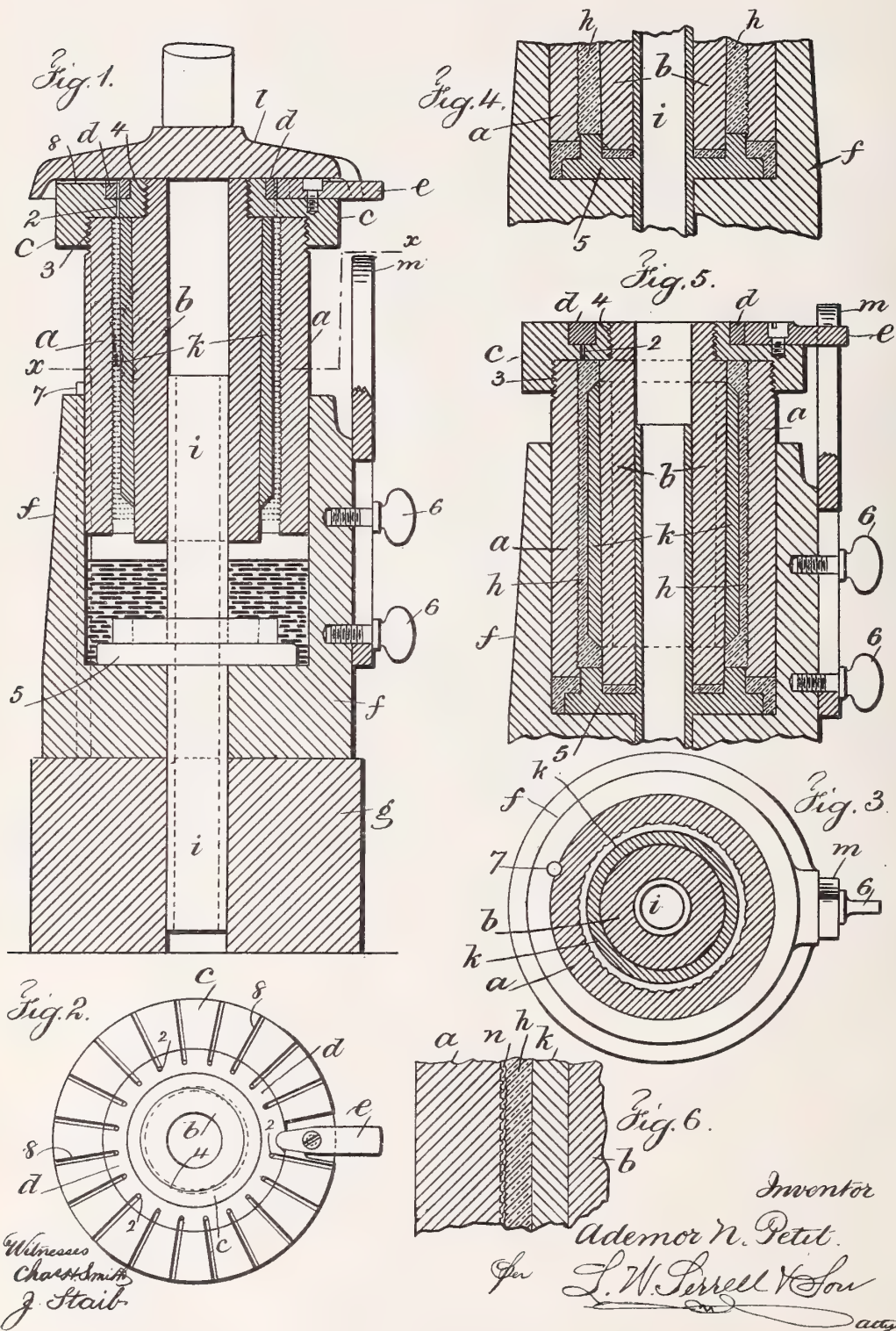
Witnesses:

HENRY A. HUBBELL,
E. M. SCILLNER.

A. N. PETIT.
 DEVICE FOR MAKING DUPLICATE SOUND RECORDS.

(Application filed Dec. 8, 1900.)

(No Model.)



UNITED STATES PATENT OFFICE.

ADEMOR N. PETIT, OF NEWARK, NEW JERSEY, ASSIGNOR TO HIMSELF AND ALBERT O. PETIT, OF SAME PLACE.

DEVICE FOR MAKING DUPLICATE SOUND-RECORDS.

SPECIFICATION forming part of Letters Patent No. 682,979, dated October 8, 1901.

Application filed December 8, 1900. Serial No. 39,126. (No model.)

To all whom it may concern:

Be it known that I, ADEMOR N. PETIT, a citizen of the United States, residing at Newark, in the county of Essex and State of New Jersey, have invented an Improvement in Devices for Making Duplicate Sound-Record Cylinders, of which the following is a specification.

Heretofore phonogram-blanks have been manufactured of a wax composition cast in a mold and thereafter trued with heated tools, and the record of sound has been thereafter engraved or cut thereon, and matrices of such sound-records have been formed and duplicate records made therefrom.

My present invention relates to devices for making such duplicate sound-records. These are preferably made of cylindrical form, and the essential feature of the present invention is in so forming the duplicate sound-record within a matrix as to finish both ends of the cylinder to obviate the after-necessity of turning down or truing the ends.

According to my present invention the duplicate sound-record cylinder may be made of even thickness throughout or thicker in one part than another or with thickened ends, and I may employ a hollow core that has parallel sides or which is tapering to conform in size with the taper mandrel of a phonograph or record-reproducing machine.

I employ a matrix of a sound-record, made in any manner well-known in the art, a hollow core, and a device to which both the matrix and the hollow core are connected, a perforated hollow base, and a tubular center received within the hollow core and base and which base receives the matrix, and means for forcing the matrix and core down into the base and causing composition material therein rendered fluid by heat to flow upward between the matrix and core under pressure to fill the interstices of the matrix and when set cooled and removed to form the duplicate sound-record cylinder. I provide means for the escape of the confined air and thereafter of a small quantity of the fluid composition to prove the absence of the air, and which means are closed or shut off before final pressure is applied to consolidate the composition material, and I provide means in connection

with the tubular center to pass in between the matrix and the hollow core, so as to finish complete one end of the duplicate sound-record cylinder while the other end is finished against the device or head connecting the matrix and hollow core. I may employ, surrounding the hollow core, a segmental sleeve, preferably somewhat shorter than the length of the finished duplicate sound-record cylinder and which segmental sleeve completely surrounds the hollow core, with one or both ends beveled, the office of the segmental sleeve being to reduce the thickness of a portion of the duplicate sound-record cylinder and leave one or both of the ends thickened, or, in other words, with inwardly-projecting rings or flanges, the diameter of which agrees with the mandrel of the machine, while the internal diameter of the cylinder is somewhat greater.

In the drawings, Figure 1 is a vertical section and partial elevation representing my improvement. Fig. 2 is a plan with the cap of the press removed. Fig. 3 is a cross-section at *xx* of Fig. 1. Fig. 4 is a partial vertical section representing the simpler form of my invention. Fig. 5 is a partial vertical section representing a modification, and Fig. 6 is a detached vertical section of some of the parts shown in Figs. 1 and 5 upon a larger scale.

I prepare the matrix *a* in any manner well-known in the art—that is to say, with a substantial backing, one end of which is made with a peripheral screw-thread.

The hollow core is represented at *b*. This may be provided with parallel sides, or it may be tapering to agree in size and form with the mandrel of a phonograph or record-reproducing machine. One end of the hollow core is reduced and provided with a peripheral screw-thread.

I employ a head device *c* with an open center and with a peripheral flange. The inner surface of the flange is made with an annular screw-surface 3 and the inner surface of the head with a screw-surface 4. The head is provided with an annular groove in the upper face to receive the ring *d*. The ring *d* is provided with perforations at spaced-apart intervals, and the head *c* is also provided with perforations 2, which in one position of the ring agree with the perforations therein. The

surfaces of the head *c* and ring *d* are provided with radial grooves 8, which extend from the perforations in the ring to the periphery of the head. The matrix *a* is connected to the head at the screw-thread 3, and the hollow core *b* is connected to the head at the screw-thread 4, so that the hollow core occupies a position concentric to the matrix, and the said head serves to hold the matrix and hollow core in a fixed relation to one another. This ring *d* is provided with a notched portion in its periphery, and the head is cut away to receive a swinging arm *e*, connected thereto by a screw forming a pivot for the arm, and the arm is provided with a curved end bearing in the recess of the ring *d*, the movement of the arm serving to impart a partial rotation to the ring, it being a fact that in one position of the ring, such as shown in Fig. 1, the perforations of the head and the ring coincide, while if the arm *e* is moved from the position shown in Fig. 2 the ring *d* is partially rotated to close off the respective perforations.

A hollow base *f* is preferably supported upon a pedestal *g*, also made hollow, and the hollow base *f* receives the matrix *a*, there being by preference a guide-pin 7 passing down through a groove made in the inner surface of the hollow base, a groove being provided in the vertical surface of the matrix also to fit the guide-pin 7, so as to prevent the matrix turning in its relation to the hollow base as the same moves vertically therein.

I provide a tube *i*, forming a center, a part of which passes through the opening in the hollow base *f* and into the opening in the pedestal *g* and the other end of which extends upward into the opening in the hollow core *b*, and upon this tube *i* is a flanged disk 5, (shown by elevation in Fig. 1 and cross-section in Figs. 4 and 5,) the flange of the disk being of a width agreeing with the opening between the matrix and the hollow core.

A device analogous to the present has been employed by me, but therein there was no provision, as in the present, for finishing both ends of the duplicate sound-record cylinder *h*.

The hollow base *f* receives material rendered plastic or fluid by heat, and the matrix and hollow core fitting within the hollow base are forced down into the said material by the cap *l* of a suitable press, which cap rests above and upon the head *c*. In this movement as the matrix and core descend the air passes out of the perforations in the head and ring and escapes by the radial grooves 8, and the composition in a fluid or plastic state rises between the matrix and the hollow core, filling the space therein, some of the composition possibly escaping through the openings in the head and ring, and as the parts arrive at this position a cam *m*, vertically adjustable by clamp-screws 6, strikes the arm *e*, swinging the same and giving a partial rotation to the ring *d*, so as to move the perforations in the ring out of alinement with

those in the head to cut off the composition and hold the same within the mold. The further downward movement by pressure upon the matrix and core compresses the composition material into the mold and the flange of the disk 5 passes in between the matrix *a* and hollow core *b*, thus preventing any more of the composition getting into the mold and at the same time pressing together into a firm and compact mass the composition within the mold in making the duplicate sound-record cylinder *h* and at the same time finishing one end of the cylinder against the under surface of the head *c* and the other end of the cylinder against the face of the flange of said disk. In this manner both ends of the cylinder *h* are finished. I prefer thereafter to pass water through the tube *i* to cool the hollow core and chill the composition material from inside outward, so that the same is cooled preparatory to the removal of the duplicate sound-record cylinder *h* from the parts in any suitable or desired manner, and in which the head *c* is simultaneously separated from the matrix *a* and the core *b* at the screw-threads 3 4. I prefer to employ, in connection with this device by which both ends of the duplicate sound-record cylinder *h* are simultaneously finished, a segmental sleeve *k*, surrounding the hollow core *b* and made shorter than the matrix. One or both ends of the segmental sleeve are tapered. In Fig. 1 I have shown one end as tapered, while in Fig. 5 both ends are shown as tapered. Where one end is tapered, the duplicate sound-record cylinder *h* is made thinner in the portion coming between the segmental sleeve *k* and the matrix, and the end adjacent to the flanged disk 5 is made of full thickness between the matrix and core, so that this latter end is thickened or made with a flange, the opening in which agrees with the diameter of the mandrel. Both ends may be made with thickened portions or rings, as shown in Fig. 5, in which the segmental sleeve *k* is shorter with both ends tapered, and in this case the duplicate sound-record cylinder *h* is provided with its respective ends made thicker or with flanges, the central portion being within of greater diameter than the ends, but with sufficient strength and rigidity for service. In any event both ends of the duplicate sound-record cylinder *h* are finished, so as to require no after turning down or treatment, one end being finished against the under surface of the head *c* and the other against the surface of the flange of the disk 5.

In the modification shown in Fig. 6 I have shown at *n* a film upon the surface of the matrix *a*, as it is possible in my present invention to first form a film upon the matrix and afterward, as hereinbefore described, to force the fluid composition material up into the mold past the film and by pressure and heat to cause the film and composition to adhere, so that the finished sound-record cylinder has a film-surface in which is the record

and the foundation or body of inferior or cheaper material, the parts being united by adhesion under heat and pressure. In this connection, however, it is preferable that the foundation material have in its composition a material of a solvent nature bearing a close relation to the materials of the film, so that the union of the film and composition will be chemical as well as mechanical. The film is preferably composed of celluloid or a composition of pyroxylin and other suitable materials, and the foundation is preferably composed of pyroxylin, camphor, and a greater quantity of a pigment—such as zinc-white, kaolin, baryta, magnesium, red lead, colored mineral earth, or similar suitable materials—which by reason of their presence and bulk cheapen the material forming the foundation.

The segmental sleeve *k* may consist of any desired or advantageous number of parts held together and to the hollow core *b* in any suitable manner, it being necessary to support the sleeve *k* upon and by the said core; but the same forms no part of the present invention.

I do not herein limit myself to the composition of the material rendered fluid or plastic by heat and employed for making the duplicate sound-record nor to the material of which the film is composed.

I claim as my invention—

1. The combination with a matrix, a hollow core and a device to which the said parts are connected at one end, of a hollow base adapted to receive the matrix and composition material rendered fluid or plastic by heat, a tube forming a center and passing into the opening in the hollow base and up into the hollow core, a disk connected to said tube within the hollow core and adjacent to the inner surface thereof and having an annular flange agreeing in width and in diameter with the lower end of the space between the matrix and hollow core, substantially as and for the purposes set forth.

2. The combination with the matrix having a screw-thread at one end and a hollow core reduced and having a screw-thread at one end, of a head having an open screw-threaded center to receive the hollow core, and to which the same is connected, and an internally-threaded flange to which the matrix is connected so that the hollow core is concentric to the matrix and the under surface of the head closes the annular opening between the matrix and hollow core at one end, a hollow base receiving the matrix and hollow core and the annular flange adapted to pass between the matrix and hollow core at the end opposite to that occupied by the connecting-head, substantially as and for the purposes set forth.

3. The combination with the matrix having a screw-thread at one end and the hollow core reduced and having a screw-thread at one end, of a head having a series of perforations an open screw-threaded center to receive the

hollow core and to which the same is connected, and an internally-threaded flange to which the matrix is connected so that the hollow core is concentric to the matrix and the under surface of the head closes the annular opening between the matrix and hollow core at one end, a ring having spaced-apart perforations and received in an annular groove in the outer surface of the head concentric to the hollow core, the perforations in the ring agreeing normally with perforations in the head, means for imparting a partial rotation to the ring to close off the perforations, a hollow base within which the matrix and hollow core are received, a tube passing down through the hollow base and up into the hollow core, and a disk surrounding and connected to the tube and lying against the inner horizontal surface of the hollow base, and an annular flange formed with and rising from the said disk and agreeing in width and diameter with the opening between the matrix and hollow core at the ends thereof opposite to the head, and means for forcing down the matrix and hollow core into the hollow base so as to force up between the matrix and hollow core material in the base rendered fluid or plastic by heat to form between the matrix and hollow core a duplicate sound-record cylinder with finished ends, substantially as set forth.

4. The combination with the matrix having a screw-thread at one end and the hollow core reduced and having a screw-thread at one end, of a head having a series of perforations an open screw-threaded center to receive the hollow core and to which the same is connected, and an internally-threaded flange to which the matrix is connected so that the hollow core is concentric to the matrix and the under surface of the head closes the annular opening between the matrix and hollow core at one end, a segmental sleeve surrounding the hollow core and shorter in length than the length of the matrix and having at least one end tapered, a ring having spaced-apart perforations and received in an annular groove in the outer surface of the head concentric to the hollow core, the perforations in the ring agreeing normally with perforations in the head, means for imparting a partial rotation to the ring to close off the perforations, a hollow base within which the matrix and hollow core are received, a tube passing down through the hollow base and up into the hollow core, and a disk surrounding and connected to the tube and lying against the inner horizontal surface of the hollow base and an annular flange formed with and rising from the said disk and agreeing in width and diameter with the opening between the matrix and hollow core at the ends thereof opposite to the head, and means for forcing down the matrix and hollow core into the hollow base so as to force up between the matrix and hollow core material in the base rendered fluid or plastic by heat to form between the

matrix and hollow core a duplicate sound-record cylinder with finished ends, substantially as and for the purposes set forth.

5 The combination with the matrix having a screw-thread at one end and a hollow core reduced and having a screw-thread at one end, of a head having screw-threaded portions to receive the hollow core and the matrix and to which the same are connected so that the
10 hollow core is concentric to the matrix and the under surface of the head closes the annular opening between the matrix and hollow core at one end, a segmental sleeve surrounding the hollow core and shorter in length than
5 the length of the matrix and having at least one end tapered, a hollow base within which the matrix and hollow core are received, a tube filling the axial center of the hollow core and hollow base, a disk having an integral

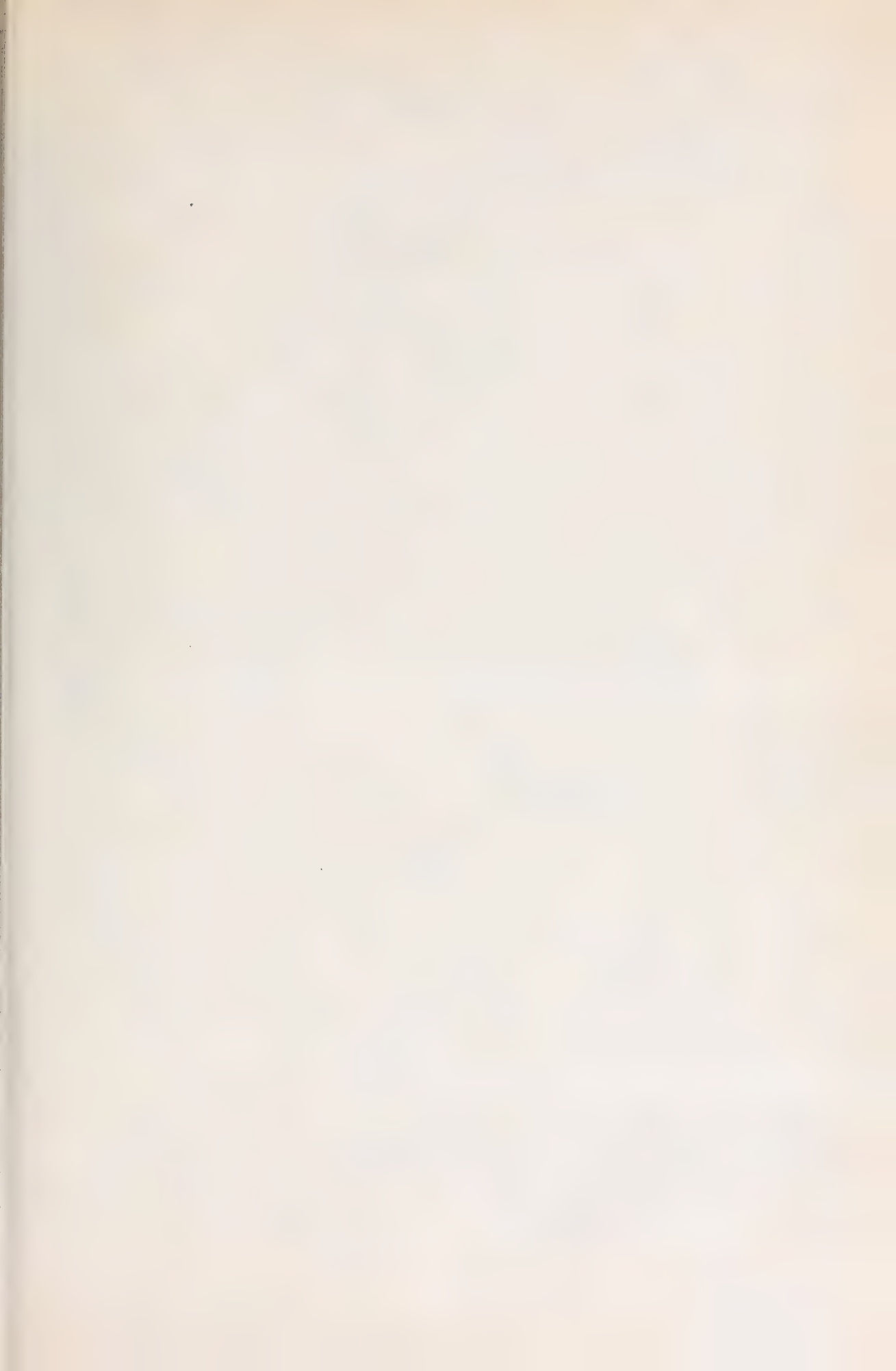
annular flange rising from the same and which 20 flange agrees in width and diameter with the opening between the matrix and hollow core at the ends thereof opposite to the head, said disk being connected to said tube and within the hollow base against the horizontal inner 25 surface thereof, whereby in the forming of the duplicate sound-record cylinder the flange of said disk passes in between the matrix and hollow core to finish one end of the duplicate sound-record cylinder while the other end is 30 finished against the under surface of the head, substantially as and for the purposes set forth.

Signed by me this 3d day of December, 1900.

ADEMOR N. PETIT.

Witnesses:

GEO. T. PINCKNEY,
BERTHA M. ALLEN.



No. 684,370.

Patented Oct. 8, 1901.

H. J. HAGEN & G. MCINTOSH.
PHONOGRAPH.

(Application filed Nov. 16, 1900.)

(No Model.)

Fig. 1.

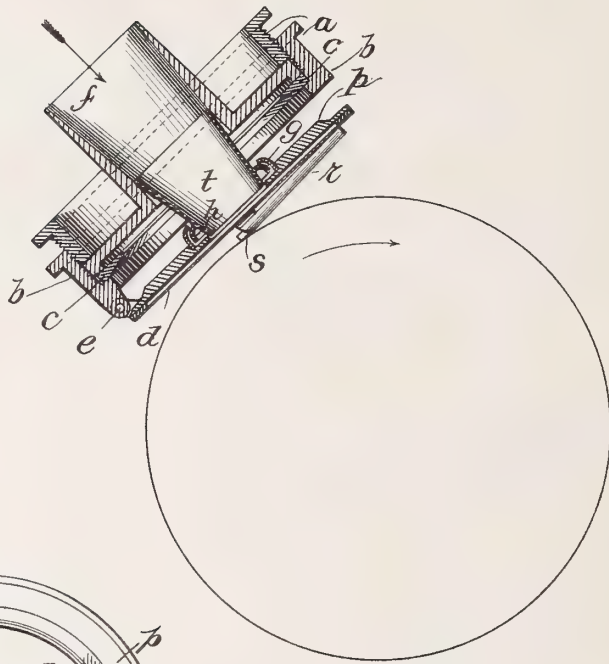
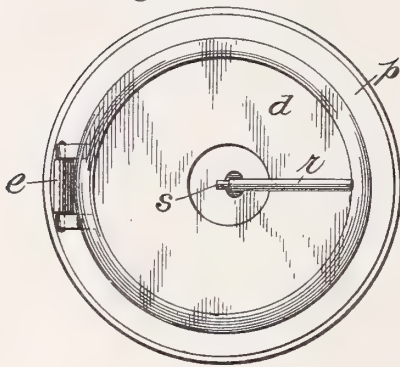


Fig. 2.



Witnesses
Edward C. Rowland.
M. H. Hating

Inventors
Henry J. Hagen & George M. McIntosh
By their Attorney
Charles J. Kintner.

UNITED STATES PATENT OFFICE.

HENRY J. HAGEN AND GEORGE McINTOSH, OF NEWARK, NEW JERSEY,
ASSIGNORS TO JOSEPH NEWCOMB BLACKMAN, OF EAST ORANGE, NEW
JERSEY.

PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 684,370, dated October 8, 1901.

Application filed November 16, 1900. Serial No. 36,708. (No model.)

To all whom it may concern:

Be it known that we, HENRY J. HAGEN and GEORGE McINTOSH, citizens of the United States, residing at Newark, in the county of Essex and State of New Jersey, have made a new and useful Invention in Phonographs, of which the following is a specification.

Our invention is directed to an improvement in phonographs in which the recording-stylus is adapted to follow the inequalities of the surface of a phonograph-record; and it has for its objects, first, to diminish the weight of the parts to which the recording-stylus is attached, and, second, to so arrange the parts of the entire apparatus that all of the sound-waves that enter the sound-conveying tube shall pass directly to the diaphragm from the source of sound and in such manner that by reason of the extremelightness and flexibility or yielding nature of the parts the best vibratory effects are had from the diaphragm and stylus.

For a full and clear understanding of our invention, such as will enable others skilled in the art to construct and use the same, reference is had to the accompanying drawings, in which—

Figure 1 is a sectional view taken through the body of the preferred form of our improved instrument, a phonographic-record cylinder being illustrated diagrammatically; and Fig. 2 is a plan view of the instrument as seen looking at Fig. 1 from the lower right-hand corner of the drawings toward the upper left-hand corner thereof.

Referring now to the drawings in detail and first to Fig. 1, *d* represents the diaphragm, made, preferably, of thin glass and secured at its outer edge by a ring of cement, glue, or otherwise to the outer edge of a light metallic diaphragm-supporting disk *p*, provided at its center with an opening, there being sufficient space between the lower surface of said disk and the diaphragm to give the necessary vibratory effect thereto.

b represents the body of the instrument, of usual form, to which the diaphragm *s* is pivotally attached at *e*.

f represents the sound-conveying tube, having a flange-shaped supporting part at its

lower end, as shown, and secured in the usual manner by a screw-threaded ring *a*, which when in position holds the tube *f* securely within the body *b*, with the flange against a ring or washer *c*.

t represents independent sound-conveying means in the nature of a thimble having the form or shape of the frustum of a cone and provided at its lower end with a ball-shaped extension *h*, adapted to fit within a corresponding socket *g*, attached to the diaphragm-supporting disk *p*, said parts being all of light metal and so constructed that when secured together in the manner shown there is freedom of movement of the entire structure about the pivotal point *e* and of the upper end of the thimble *t* in the lower end of the tube *f*.

r represents a rod secured at one edge and the center of the diaphragm in the usual manner and provided with the usual sapphire recording-stylus *s*.

The operation is as follows: When the phonograph-record cylinder is rotated from left to right in the direction of the curved arrow and sounds are emitted in the direction of the straight arrow into the tube *f* and thimble *t*, the diaphragm is caused to vibrate in the usual manner, and by reason of the pivoted support thereof and attached parts, together with the ball-and-socket support of the conical sound-conveying thimble *t* in the lower end of the tube *f*, the stylus *s* readily partakes of such movements as the inequalities of the surface of the record may possess, and at the same time the thimble *t* adjusts itself with relation both to the tube *f* and the diaphragm-supporting disk *p* and in such manner that none of the sound-waves which enter the tube *f* are permitted to escape; but all of them are concentrated upon the center of the diaphragm.

It will be appreciated that owing to the extreme lightness of all of the parts the full vibratory effect of the diaphragm *d* is imparted to the stylus *s* under all conditions of usage, said diaphragm not being under any abnormal strain, but susceptible of delicate movements for the most delicate sounds.

We do not limit our invention to the especial

details of construction shown and hereinbefore described, as we believe we are broadly entitled to claim a phonographic sound-recording instrument in which the diaphragm is 5 yieldingly secured to the body of the instrument and the sound-conveying means is in turn yieldingly attached to the diaphragm-supporting disk, said sound-conveying means being free or independent of the body of the 10 instrument itself, whereby extreme lightness and flexibility of the operative parts of the instrument are secured, and our claims are generic as to this feature. Although we have shown the diaphragm-supporting disk *p* pivotally secured to the body or frame of the 15 instrument, we contemplate other yielding means of support, the essence of our invention lying broadly in utilizing the principle of supporting the diaphragm and its immediate attachments independently of the frame 20 of the instrument in such manner that the recording-stylus follows the inequalities of the record-cylinder and is subjected to a minimum amount of pressure therefrom, while substantially all of the sound-waves are conveyed 25 directly to the diaphragm by reason of the yielding nature of the parts between the diaphragm and the sound-conveying tube; nor do we limit our invention in its application to a recording-phonograph, as it may obviously be used in connection with sound-reproducing phonographs, and our claims are designed to include all such structures.

Having thus described our invention, what 35 we claim, and desire to secure by Letters Patent of the United States, is—

1. A phonograph having its diaphragm-supporting disk, and diaphragm and recording-stylus carried thereby, secured yieldingly 40 to the body of the instrument; in combination with sound-conveying means carried directly by the diaphragm-supporting disk and yieldingly attached thereto with its free end extending into the sound-conveying tube carried by the body of the instrument, substantially as described. 45

2. A phonograph having its diaphragm-supporting disk, and diaphragm and record-

ing-stylus carried thereby, secured to the 50 body of the instrument; in combination with sound-conveying means consisting of a thimble having the shape of the frustum of a cone, with its smaller end yieldingly attached to the diaphragm-supporting disk and its larger end extending into the sound-con- 55 veying tube and adapted to move freely therein, substantially as described.

3. A phonograph having its diaphragm, diaphragm-supporting disk and recording-stylus pivotally secured to the body of the 60 instrument; in combination with sound-conveying means yieldingly attached to the diaphragm-supporting disk and extending upward with its upper end free to move in the lower end of the sound-conveying tube, the 65 arrangement being such that all of the sound-waves which enter the sound-conveying tube will be concentrated upon the diaphragm, substantially as described.

4. A phonograph having its diaphragm, 70 diaphragm-supporting disk and recording-stylus pivotally secured to the body of the instrument; in combination with a conical-shaped thimble having its lower end yieldingly attached to the diaphragm-supporting 75 disk and its upper end free to move in the lower end of the sound-conveying tube, substantially as described.

5. A phonograph having its diaphragm, diaphragm-supporting disk and recording- 80 stylus pivotally secured to the body of the instrument; in combination with a conical-shaped thimble connected by ball-and-socket joint to the diaphragm-supporting disk with its upper end free to move in the lower end 85 of the sound-conveying tube, substantially as described.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

HENRY J. HAGEN.
GEORGE McINTOSH.

Witnesses:

C. J. KINTNER,
J. NEWCOMB BLACKMAN.

No. 684,455.

Patented Oct. 15, 1901.

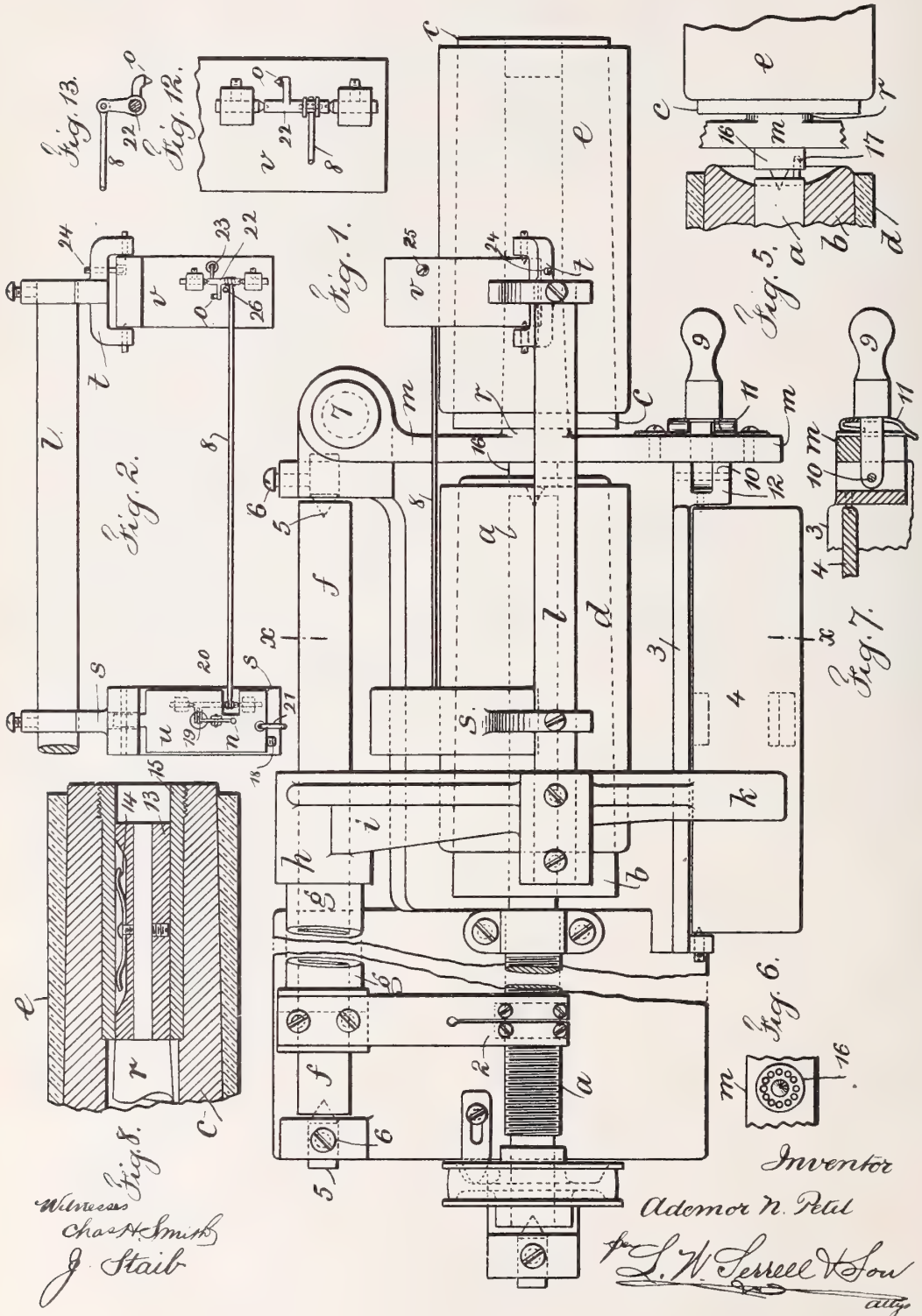
A. N. PETIT.

MACHINE FOR DUPLICATING PHONOGRAPH OR SIMILAR RECORDS.

(Application filed Aug. 17, 1900.)

(No Model.)

3 Sheets—Sheet 1.





No. 684,455.

Patented Oct. 15, 1901.

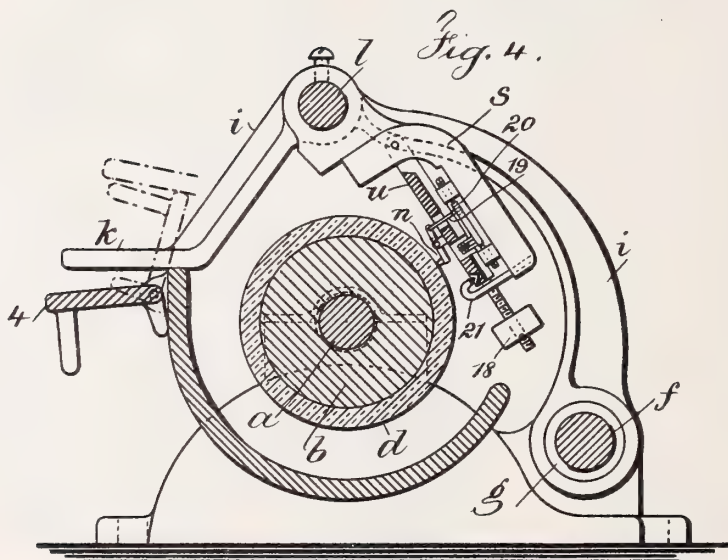
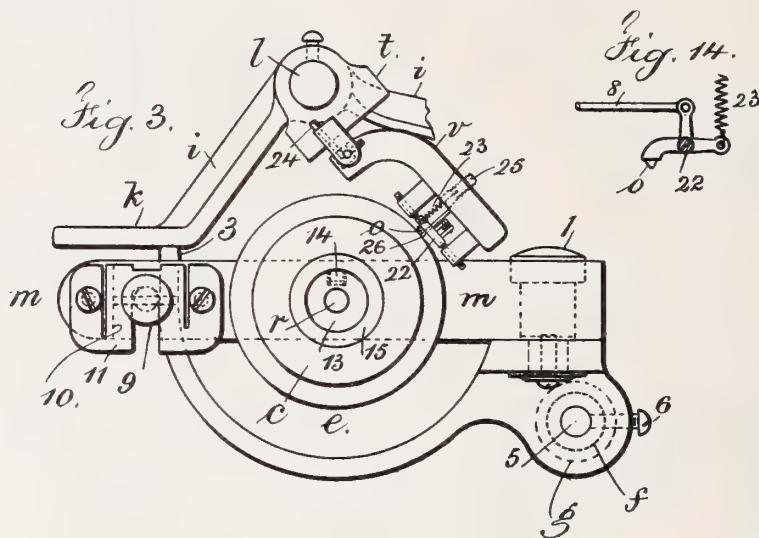
A. N. PETIT.

MACHINE FOR DUPLICATING PHONOGRAPH OR SIMILAR RECORDS.

(Application filed Aug. 17, 1900.)

(No Model.)

3 Sheets—Sheet 2.



Witnesses

Chas H. Smith
J. Staib

Inventor

Ademore N. Petit.
per L. W. Serrell & Son
all.



No. 684,455.

Patented Oct. 15, 1901.

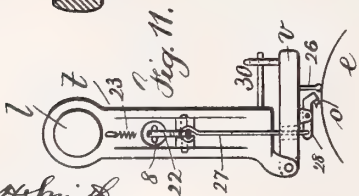
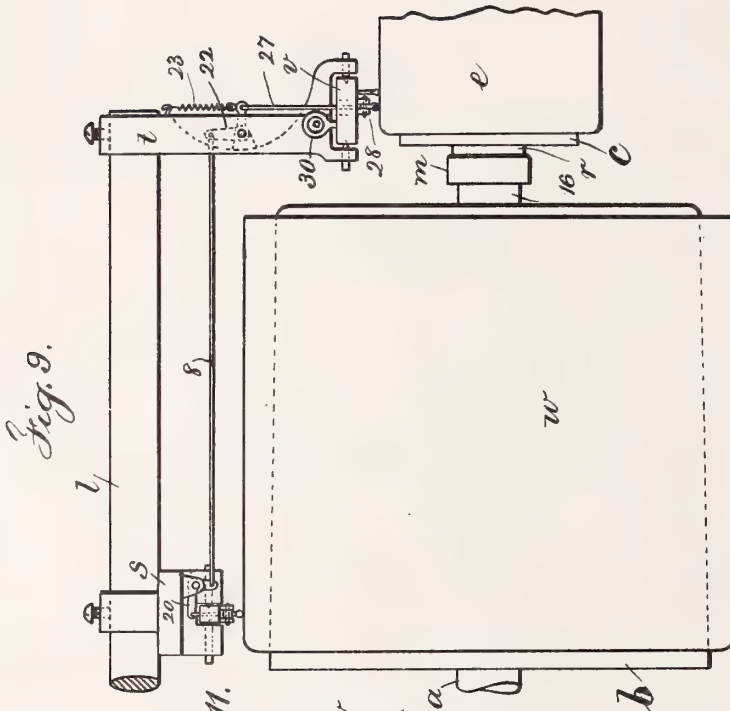
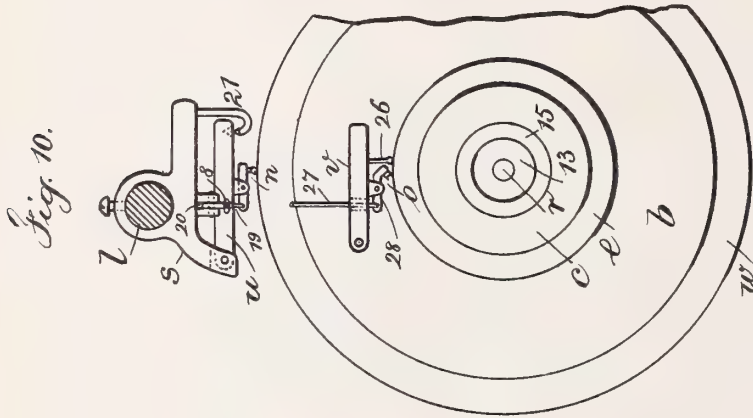
A. N. PETIT.

MACHINE FOR DUPLICATING PHONOGRAPH OR SIMILAR RECORDS.

(Application filed Aug. 17, 1900.)

(No Model.)

3 Sheets—Sheet 3.



Inventor

Ademor N. Petit.

per L. W. Serrell & Son
attys

Witnesses
Chas. H. Smith
J. Staib

UNITED STATES PATENT OFFICE.

ADEMOR N. PETIT, OF NEWARK, NEW JERSEY, ASSIGNOR TO HIMSELF AND
ALBERT O. PETIT, OF SAME PLACE.

MACHINE FOR DUPLICATING PHONOGRAPH OR SIMILAR RECORDS.

SPECIFICATION forming part of Letters Patent No. 684,455, dated October 15, 1901.

Application filed August 17, 1900. Serial No. 27,125. (No model.)

To all whom it may concern:

Be it known that I, ADEMOR N. PETIT, a citizen of the United States, residing at Newark, in the county of Essex and State of New Jersey, have invented an Improvement in Machines for Duplicating Phonograph or Similar Records, of which the following is a specification.

My present invention is designed as an improvement upon the devices shown and described in my prior Letters Patent, one dated September 11, 1900, No. 657,785, and the other dated November 20, 1900, No. 662,301.

The present invention is designed to improve the structure and efficiency of the devices of the former applications, to bring the styles more closely down to their work upon the record and blank cylinders, to permit a latitude of movement to the following style, and to make more positive the movement of the duplicating-style.

In carrying out my present invention I employ a detachable back shaft, which may be removed from the bed and with it the following and duplicating styles and the devices carrying the same, and I also employ an improved form of coupler for the axial shafts, centering the same and causing them to travel in unison, and a swing-arm bracket, locking-bolt, and spring locking device, the bracket carrying the shaft of the sleeve or mandrel for supporting the blank cylinder and said devices coupling the same to the main shaft and locking the same in position. In connection with the shaft for the mandrel of the blank cylinder I employ friction devices for holding the mandrel upon the shaft, but which permit of the ready removal of the mandrel, if desired. A lifting-bar is employed for raising the arms, the devices connected thereto, and the styles carried thereby to elevate the styles above the record and blank cylinders, and I further employ peculiar devices connected to the following and duplicating styles and by which their operation is effected, said devices being connected together so as to operate in unison; the devices of the following style being supported so that a latitude of movement is permitted the following style in following uneven grooves upon the record-cylinder, and the devices carrying the dupli-

cating-style are so connected that only an up-and-down movement is permitted, insuring a more perfect duplication of the record. The devices of my present invention are also applicable to the duplication of sound-records from a master-roll.

In the drawings, Figure 1 is a plan representing my improvement. Fig. 2 is an inverted plan of the following and duplicating styles and devices connected therewith. Fig. 3 is an end view of the parts shown in Fig. 1 from the right hand. Fig. 4 is a cross-section and partial elevation at about the line *xx* of Fig. 1. Fig. 5 is a partial plan and section at the connection between the shaft of the record-cylinder and the shaft of the blank cylinder. Fig. 6 is an end view of the coupling device for connecting the axial shafts. Fig. 7 is a partial elevation and section of the spring locking device for connecting the pivoted arm carrying the shaft of the blank cylinder and mandrel to the frame of the machine. Fig. 8 is a sectional plan of the shaft, mandrel, and blank cylinder, together with the frictional engaging devices for connecting the same. Fig. 9 is an elevation showing the application of my improvement to the production of a record on an ordinary blank cylinder from a master-roll of exaggerated size. Fig. 10 is an end view of the master-roll and the blank cylinder, together with the styles coming in contact with the surfaces thereof. Fig. 11 is an end elevation of the duplicating-style device shown in Fig. 9. Fig. 12 is an inverted plan, and Fig. 13 a side elevation, in larger size, of a modified form of devices carrying the duplicating-style. Fig. 14 is an elevation in larger size of the duplicating-style shown in Figs. 2 and 3.

The shaft *a* is mounted in and supported by suitable bearings upon the bed. A part of said shaft is exteriorly threaded and provided with a pulley for its rotation, and the fixed sleeve or mandrel *b* is secured at one end of said shaft and carries the record-cylinder *d*.

c represents the removable sleeve or mandrel, and *e* the blank cylinder thereon. The back rod *f* is supported upon the bed of the machine by standards, in which are the removable pin-centers *5*, held in place by

screws 6, which provide for the removal of the rod and the parts carried thereby. The sleeve *g* surrounds the rod *f*, and a sleeve *h* is carried by the sleeve *g*, and a curved arm *i* is made integral with the sleeve *h* and extends forward over the record-cylinder *d*, and a screw-feed 2 is connected to the sleeve *g* with a half-nut made in the usual form engaging the threaded portion of the shaft *a* and by which the sleeve *g* is moved lengthwise of the rod *f*.

The curved arm *i* terminates in a rest-bar *k*, formed as an integral continuation of the said arm, and this arm *i* supports an arm *l*, secured thereto and at right angles to the arm *i* and parallel with the shaft *a*. The bed of the machine is provided with a rest and guide 3 for the rest-bar *k*, the same being substantially a straight edge upon which the bar *k* rests and along which it moves with the movement of the sleeve *g*, so as to maintain the styles in a fixed relation to the cylinders. I provide a pivoted frame 4, having a finger adapted to be engaged by the hand, the said frame acting when swung and its outer end elevated to come against the rest-bar *k* and raise the same, together with the curved arm *i*, the arm *l*, and the devices carrying the styles, to move the same away from contact with the record and blank cylinders.

The arm *m* is pivoted at 7 to the bed of the machine and the shaft *r* passes through a hub made integral with or connected to the said arm *m*. This shaft *r* is preferably reduced at its free end and surrounded by a sleeve 13, removably fixed thereto by a screw, and a spring 14 in a recess in the said sleeve is also secured by a screw, (see Fig. 8,) and the removable sleeve or mandrel *c* is preferably constructed with an internal sleeve 15, secured thereto, the sleeve 15 being preferably of metal and screwed to the mandrel *c*, while the mandrel *c* may not be of metal, but is tapering and adapted to receive the blank cylinder *e*. With this construction the mandrel *c* and sleeve 15 may be readily and quickly removed from the shaft *r* and the sleeve 13, if desired, or this construction will facilitate taking the cylinder *e*, after the duplication of a record, away from the taper mandrel *c*, the shaft *r*, sleeve 13, and spring 14 constituting the friction device for holding the taper mandrel *c* in place upon the shaft during the duplication of the record.

The hub 16 is at the exposed end of the shaft *r*, and it is made with a pointed center and with a circular row of holes around the pointed center, and the free end of the shaft *a* has a recessed center and a projecting pin 17, and in coupling the shaft *a* to the shaft *r* the recessed end of the shaft *a* receives the pointed center of the shaft *r* and the pin 17 enters one of the holes of the row of holes in the hub 16, and these holes come closely together, so as to receive the pin 17 at almost any position of the blank cylinder when the

same is upon the taper mandrel *c*, so that no special adjustment is necessary.

I provide jaws 12 on the stationary bed of the machine, and a handle 9 is pivoted to said jaws by the pin 10, and I provide on the pivoted arm *m* a spring-frame 11. This spring-frame 11 is especially shown in Figs. 1, 3, and 7 and comprises end portions that are secured by screws to the pivoted arm *m* and a central portion bent outward and over backward and standing slightly away from the fixed part and centrally notched from the under edge to receive the handle 9 when moved upwardly into frictional contact with the outwardly-bent portion of the spring-frame. These devices are employed with the pivoted arm *m* and the parts carried thereby, and when said arm is swung around to place to couple the axial shafts the said parts are held in position by the handle 9 and spring-frame 11.

The arm *l* carries the following and duplicating styles and the parts acting in connection, as follows: The bracket *s*, inclined, as shown in Fig. 4, is provided with an opening for the arm *l*, and a set-screw secures the said bracket *s* to said arm, and at the free end of the arm *l* there is a yoke-bracket *t*, also secured to the arm by a set-screw. A plate *u*, having a tongue passing into a recess or mortise in the bracket *s*, is pivotally connected to the said bracket by a pin passing through the tongue, and there is preferably a looseness at this pivotal connection, so that the plate *u* not only has an up-and-down motion, but a lateral motion to a certain extent, and a screw-rod and weight 18 are preferably connected to the lower or free end of the plate *u*. The following style *n* is upon a bar pivoted to the frame *u*, and a link 19, passing through an opening in the plate *u*, connects the bar of the following style with a spread bell-crank lever 20, pivoted in bearings to the bracket 8, the position of the bell-crank lever 20 being fixed and that of the following style *n* being movable upon the plate *u*. The said lever 20 consequently rocks with the movement of the following style. At the lower edge and in the under surface of the plate *u* I prefer to make a pointed recess and to employ a hook 21, the point of which passes into the recess and the stem of which passes below the said plate and is secured to the bracket *s*, the office of this hook being to limit the movement of the plate *u* toward the record-cylinder and hold the plate when the parts are elevated by the pivoted frame 4, it being possible between the weight 18 and the movement of the following style, its arm, the link 19, and the spread bell-crank lever 20 to effect a delicate adjustment that will cause the following style *n* to transmit, through the rod 8, to the duplicating-style the movements caused by the delicate undulations of the record-cylinder. The head *v* is pivotally connected to the yoke-bracket *t*, and this yoke-bracket is provided with bearings for the rod 22, said rod 22 in turn being provided with an arm carrying the

duplicating-style *o*, and a second arm to which the spring 23 is connected at one end, with the other end of the spring connected to an adjustable tension-screw 25. The rod 22 occupies a position at right angles to the axial line of the shafts *a* and *r*, while the arm connected thereto and carrying the duplicating-style *o* is at right angles to the rod 22 and axially in line with the said shafts, and said rod 22 carries arms to which are pivoted the connecting-rod 8, said rod 8 extending across between the bell-crank lever 20 of the recording-style and the rod 22 of the duplicating-style, the said rod forming a fixed connection between the respective styles effecting the simultaneous movement of the styles, or, in other words, causing the respective styles to operate in unison and the duplicating-style to repeat the delicate movements of the following style. I provide a pin 24, passing through the yoke-bracket *t* and into a recess in the pivoted head *v*, so as to limit the movement of the head *v* and prevent the same dropping when the arm *l* and parts connected thereto are swung upward.

In connection with the duplicating-style I also employ a guide 26, connected to the pivoted head *v*, and preferably vertically adjustable, the office of which is to rest upon the surface of the blank cylinder *e* and following the contour of the surface thereof to give location to the duplicating-style *o*, effecting a proper regular movement of the duplicating-style and insuring the proper depth of cut.

In Figs. 9, 10, and 11 I have shown a modified construction of my improvement in which the following and duplicating styles and the devices supporting the same are adapted for use with the master-roll *w*, upon which has been made a sound-record, the said sound-record being really of magnified size or proportion on account of the exaggerated size of the master-roll, the surface thereof in making the record having traveled faster than would be the case with the regular size of cylinder. In this modification the devices of the following style are practically identical with those shown in Figs. 2 and 4, and the devices of the duplicating-style are almost the same as those shown in Figs. 2 and 3, there being, however, a slight modification in the construction, so as to transmit the movement of the connecting-rod 8 down to the duplicating-style *o*, said device generally comprising a rod 27 and an arm 28 connected thereto, and which arm carries the duplicating-style. In this modification the parts are so proportioned that the cuttings in the cylinder *e*, duplicating the sound-record, will be properly rendered. In this device the eye secured to the head *v*, Figs. 9 and 11, and the pin 30, connected to the yoke-bracket *t*, perform the same function as the pin 24--viz., that of preventing the head *v* falling when the parts are elevated.

In the form of duplicating-style shown in Figs. 12 and 13 the arm carrying the style

projects from the opposite side of the rod 22 from that shown in Figs. 2 and 3 and the spring 23 is dispensed with. The duplicating-style being on the side opposite to the rod 8 and its downward movement being influenced by the adjustable weight 18, the tension-spring is not required and the movement is made positive.

I claim as my invention--

1. In a machine for duplicating phonograph and similar records, the combination with the record and blank cylinders and the mandrels carrying the same, of a shaft for the mandrel of the record-cylinder having a recess in its free end and a projecting pin, a shaft for the mandrel of the blank cylinder and a bearing or support therefor, the end of said shaft having a pointed projection and a row of holes surrounding the said projection and adapted to receive the aforesaid projecting pin when the ends of the shafts are brought axially in line, substantially as set forth.

2. In a machine for duplicating phonograph and similar records, the combination with the record and blank cylinders, the mandrels and their shafts, of an arm pivoted to the bed or frame of the machine and carrying the shaft of the blank cylinder and adapted to be swung to one side for the removal of the record-cylinder, and a spring-actuated frictional locking device adapted to connect the free end of said arm to the bed or frame of the machine to hold the shafts axially in line, substantially as set forth.

3. In a machine for duplicating phonograph and similar records, the combination with the record and blank cylinders, the mandrels and their shafts, of an arm pivoted to the bed or frame of the machine and carrying the shaft of the blank cylinder and adapted to be swung to one side for the removal of the record-cylinder, a handle and jaws connected to the bed or frame of the machine and to which the handle is pivoted, and a notched spring-frame secured to the face of the arm and adapted to receive and frictionally hold the handle in securing the said arm in place and the shafts axially in line, substantially as set forth.

4. In a machine for duplicating phonograph and similar records, the combination with the blank cylinder and its mandrel, of a sleeve secured to the mandrel and within one end of the same, a shaft carrying the mandrel and blank cylinder and a support therefor, the free end of the shaft being reduced in size and a device connected to the free end of the shaft and adapted to frictionally engage the sleeve of the mandrel in holding the parts together, substantially as set forth.

5. In a machine for duplicating phonograph and similar records, the combination with the blank cylinder and its mandrel, of a sleeve secured to the mandrel and within one end of the same, a shaft carrying the mandrel and blank cylinder and a support therefor, the free end of the shaft being reduced in size, and a sleeve mounted on the reduced free end

of the shaft and secured in position and having a recess and a friction-spring secured in the recess and adapted to engage the inner surface of the sleeve of the mandrel in frictionally holding the parts together, substantially as set forth.

6. In a machine for duplicating phonograph and similar records, the combination with the record and blank cylinders and mandrels therefor in the same axial line the following and duplicating styles and the movable swinging support or frame therefor, of a frame pivoted to the bed or frame of the machine and adapted to be swung over into a different position and in so doing to elevate the frame carrying the said styles to raise the same above the surface of the record and blank cylinders, substantially as set forth.

7. In a machine for duplicating phonograph and similar records, the combination with the record and blank cylinders and mandrels therefor in the same axial line, the following and duplicating styles, devices for connecting the said styles to cause them to move in unison and the pivotal supports therefor, of an arm supported from and movable longitudinally of the machine, a bracket carried by said arm, and a device movable up and down and laterally and carrying the devices of the following style, and means for loosely pivoting the said device to the bracket whereby said up-and-down and lateral motion is provided for the following style, substantially as set forth.

8. In a machine for duplicating phonograph and similar records, the combination with the record and blank cylinders and mandrels therefor in the same axial line, the following style and duplicating style and devices by which said following style is pivotally mounted, of a loosely-pivoted plate carrying the said following style and the said pivotal devices and capable of a lateral movement, a fixed bracket to which the said plate is pivoted and a longitudinally-movable support for the said bracket, substantially as set forth.

9. In a machine for duplicating phonograph and similar records, the combination with the record and blank cylinders and mandrels therefor in the same axial line, the following style and devices by which the same is pivotally mounted, of a loosely-pivoted plate carrying the said style and the said pivotal devices, a fixed bracket to which the said plate is pivoted, a longitudinally-movable support for the said bracket, a duplicating-style and devices by which the same is pivotally mounted, a pivoted head carrying the said duplicating-style and its pivotal connections and adapted for movement in one direction only, and a yoke-bracket to which the said pivoted head is connected, the yoke-bracket being upon the said longitudinally-movable support, substantially as set forth.

10. In a machine for duplicating phonograph and similar records, the combination

with the longitudinally-movable supporting-arm *l*, of a fixed bracket connected thereto, a plate loosely pivoted to said bracket, the following style upon an arm pivoted to said plate, a spread bell-crank lever pivoted to said bracket and a link passing through a hole in the pivoted plate and connecting the bell-crank lever with the arm of the following style, a duplicating-style and an arm extending between the following and duplicating styles for causing the same to move in unison, substantially as set forth.

11. In a machine for duplicating phonograph and similar records, the combination with the longitudinally-movable supporting-arm *l*, of a fixed bracket connected thereto, a plate loosely pivoted to said bracket, the following style upon an arm pivoted to said plate, a spread bell-crank lever pivoted to said bracket and a link passing through a hole in the pivoted plate and connecting the bell-crank lever with the arm of the following style, a duplicating-style and an arm extending between the following and duplicating styles for causing the same to move in unison, an adjustable weight connected to the said pivoted plate and a yoke connected to the bracket and having a pointed end adapted to come into engagement with the pivoted plate, substantially as and for the purposes set forth.

12. In a machine for duplicating phonograph and similar records, the combination with the longitudinally-movable supporting-arm *l*, of a fixed bracket connected thereto, a plate loosely pivoted to said bracket, the following style upon an arm pivoted to said plate, a spread bell-crank lever pivoted to said bracket, and a link passing through a hole in the pivoted plate and connecting the bell-crank lever with the arm of the following style, a duplicating-style and an arm extending between the following and duplicating styles for causing the same to move in unison, and a pivoted head to which the duplicating-style and the devices supporting the same are connected, said pivoted head being capable of motion in one direction only, and a stop for limiting said motion, substantially as set forth.

13. In a machine for duplicating phonograph and similar records, the combination with the following and duplicating styles, a connection between the styles for causing them to move in unison, and a support for the following style, of a pivoted head supporting the devices of the duplicating-style, a yoke-bracket to which the said head is pivoted and is capable of movement in one direction only, and a stop for limiting the movement of said pivoted head, substantially as set forth.

14. In a machine for duplicating phonograph and similar records, the combination with the following and duplicating styles, a connection between the styles for causing

them to move in unison, and a support for the following style, of a rod 22 to which the connection between the respective styles is pivoted at one end, a head to which the said
5 rod is pivoted, an arm extending out from the said rod and carrying the duplicating-style, a guide 26 connected to the said pivoted head and occupying a position adjacent to the du-

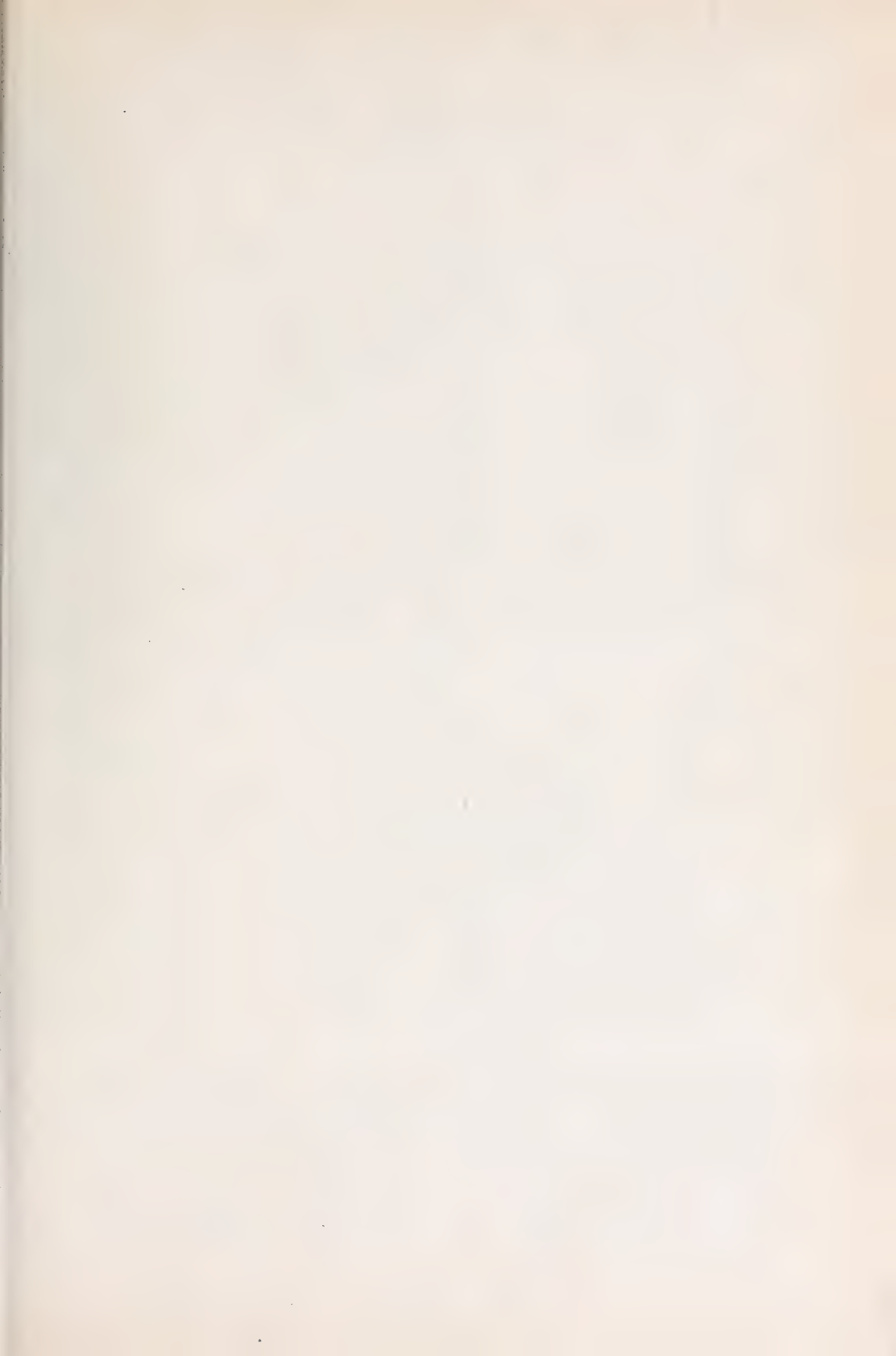
plicating-style and a support for the said pivoted head, substantially as set forth. 10

Signed by me this 9th day of August, 1900.

ADEMOR N. PETIT.

Witnesses:

GEO. T. PINCKNEY,
S. T. HAVILAND.



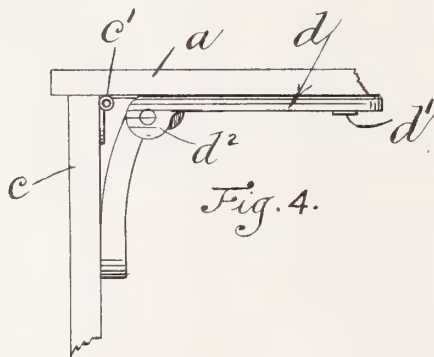
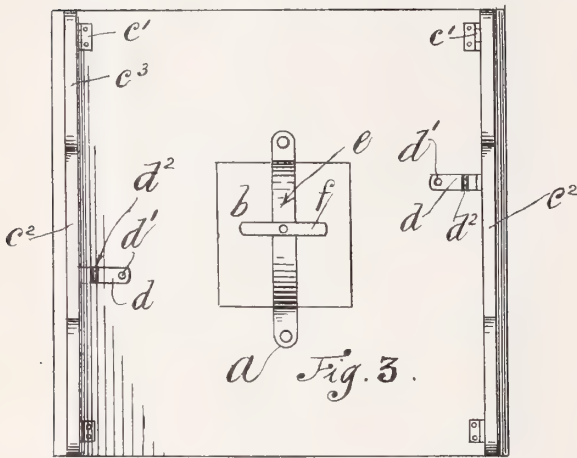
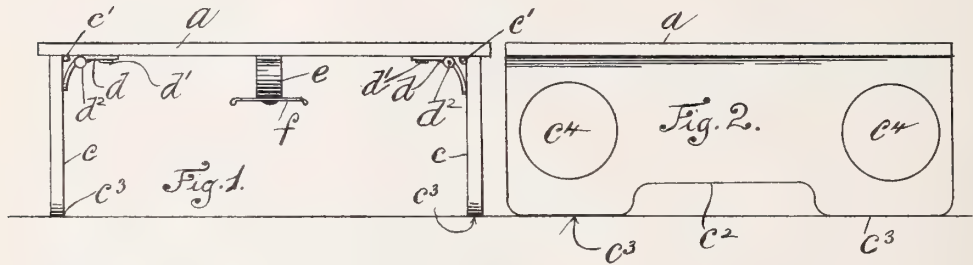
No. 684,496.

Patented Oct. 15, 1901.

E. W. CHANT.
GRAMOPHONE STAND.

(Application filed Nov. 20, 1899.)

(No Model.)



Witnesses
Alpha Thornton.
Vincent Hughes

Inventor
Edward Wilson Chant.
By J. W. Howard

Attorney.

UNITED STATES PATENT OFFICE.

EDWARD WILSON CHANT, OF SHREWTON, ENGLAND.

GRAMOPHONE-STAND.

SPECIFICATION forming part of Letters Patent No. 684,496, dated October 15, 1901.

Application filed November 20, 1899. Serial No. 737,680½. (No model.)

To all whom it may concern:

Be it known that I, EDWARD WILSON CHANT, a subject of the Queen of Great Britain, residing at Shrewton, in the county of Wilts, England, have invented a new and useful Improvement in Gramophone-Stands, of which the following is a specification.

This invention relates to an improvement in gramophone-stands, and has for its object to provide a portable, simple, and inexpensive folding stand for use with gramophones and similar sound-recording instruments, which shall greatly increase the volume and intensity of the sound produced by such instruments.

In carrying my invention into practice I provide a square or other shaped platform having a central opening therein and a number of circular or other recesses in its surface. To two sides of the said platform are hinged two flaps or folding supports whose lower edges are preferably curved, so that when the said supports are opened out and placed upon a table or the like the lower edges of such supports will come into contact with the table, for instance, at four points. Hinged stays are pivoted to the under side of the platform for the purpose of supporting the before-mentioned folding flaps or supports in their open position. Openings are provided in the said folding flaps or supports, through which the joints of the said hinged stays partially project in order that the folding flaps or supports may lie as close as possible upon the under side of the platform when the former are folded beneath the latter. A curved metal or other bridge spans the opening in the platform, to the center of which bridge a catch is pivoted for the purpose of securing the folding flaps or supports in their folded position. In lieu of this central catch end catches may be pivoted or hinged to the under side of the platform to effect a similar purpose.

In order that this my said invention may be the more readily understood and carried into practical effect, reference is hereby made to the accompanying sheet of illustrative drawings, wherein—

Figure 1 is a side elevational view of the stand in its open position; Fig. 2, an end elevational view thereof; Fig. 3, a plan view of the stand, while Fig. 4 is a view of a detail.

Referring to the drawings, wherein like

letters of reference indicate corresponding parts throughout the various figures, *a* indicates the platform, and *b* the central opening therein, which may be of any suitable shape and size.

c represents the two folding supports, which are hinged to the platform *a* at *c'*. The folding supports have recesses *c''* in the lower edges, so that when the stand is placed on a table or the like the said supports will come in contact with the former at four points *c'''*.

d represents the stays for maintaining the hinged supports *c* in their open or extended position, such stays being pivoted at one end to the under side of the platform *a*, as at *d'*, while they are hingedly jointed about midway of their length, as at *d''*, so that when the stand is to be folded such stays can be caused to lie flat against the under side of the platform, openings *c''* being provided in the folding supports *c* in order that the joints of the said stays may project somewhat through same when the supports are in the folded position.

e represents a downwardly-curved metal bridge to the center of which a catch *f* is pivoted for the purpose of securing the folding supports *c* in their closed position. In lieu of this central catch, end catches (not shown) may be pivoted or hinged to the under side of the platform *a* to effect the foregoing purpose.

What I claim as my invention, and desire to secure by Letters Patent, is—

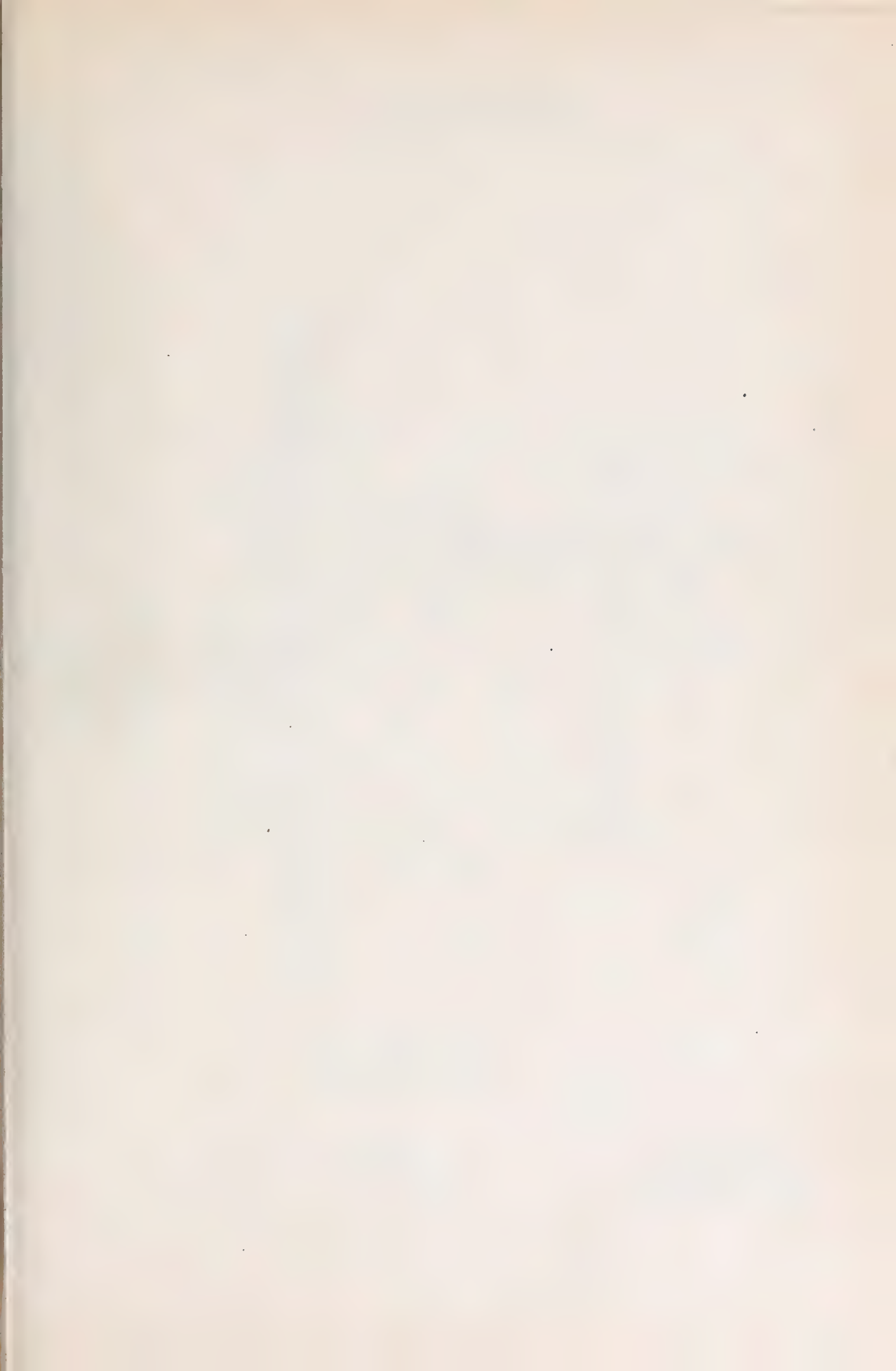
In stands or sound-boards for gramophones, the combination with a table having hinged folding side supports, a central opening, and hinged stays for supporting said side supports in their extended position; and a bridge for securing the hinged side supports in their folded position; of the curved lower edges of said hinged side supports whereby the lower edges of said side supports only contact with the supporting-surface at four points when in their opened-out position; and openings in said hinged side supports to let the joints of said hinged stays lie therein to enable the said side supports to be folded snugly up against the under side of the table, substantially as specified.

EDWARD WILSON CHANT.

Witnesses:

VINCENT HUGHES,

ALFRED A. THORNTON.



No. 684,943.

Patented Oct. 22, 1901.

G. W. MERRILL, JR.
PHONOGRAPH OR GRAPHOPHONE.

(Application filed Jan. 31, 1900.)

(No Model.)

2 Sheets—Sheet 1.

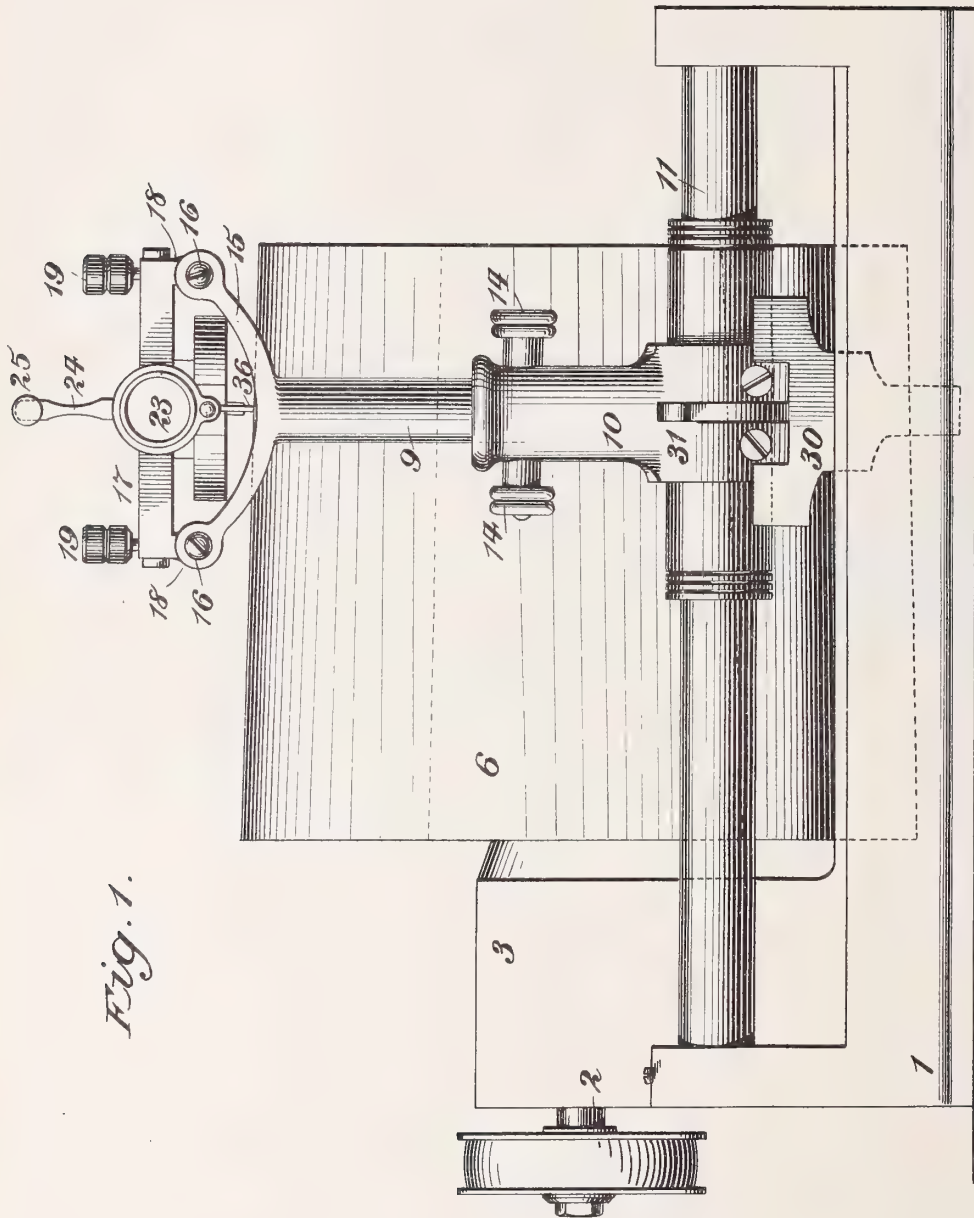


Fig. 1.

Witnesses
Edward L. Howard
J. J. Bruckshaw

George W. Merrill Jr. Inventor
By his Attorney A. M. Pierce



No. 684,943.

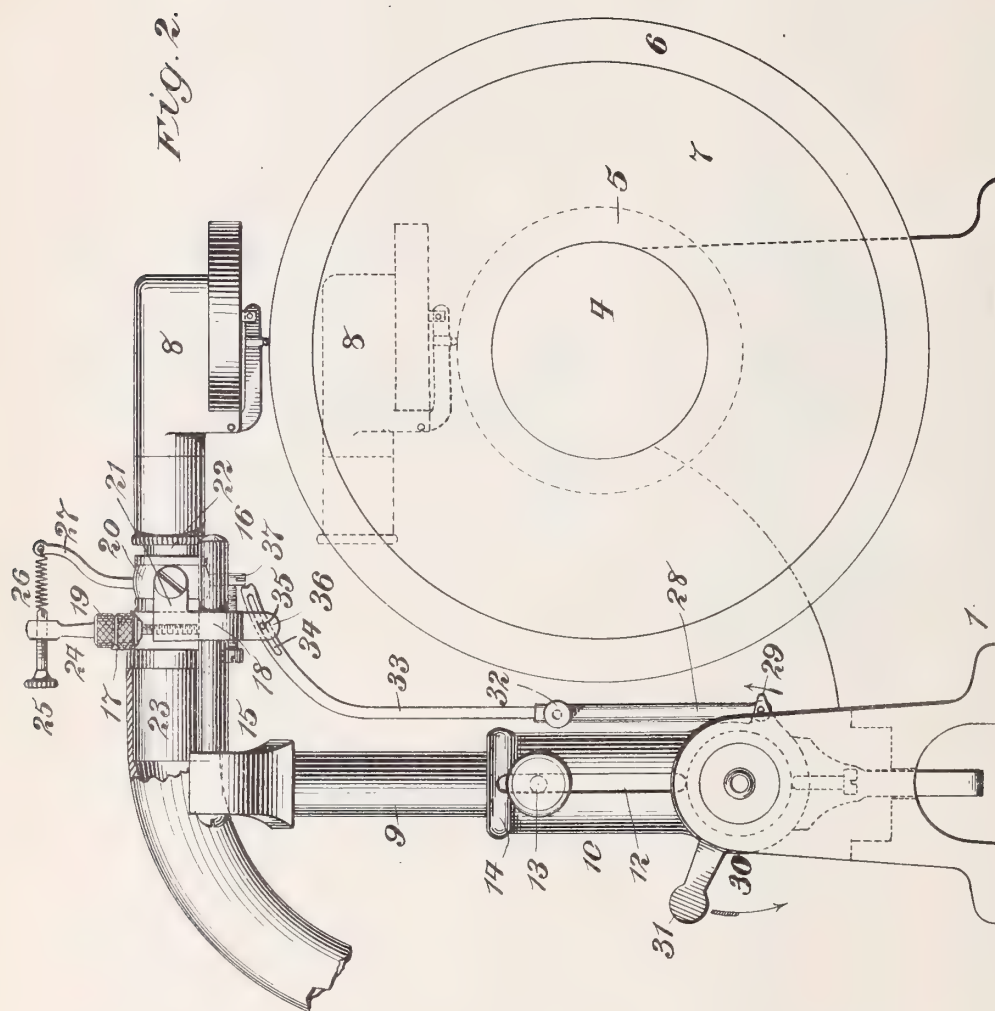
Patented Oct. 22, 1901.

G. W. MERRILL, JR.
PHONOGRAPH OR GRAPHOPHONE.

(Application filed Jan. 31, 1900.)

(No Model.)

2 Sheets—Sheet 2.



Witnesses
Edward C. Crawford.
S. B. Brewster

George W. Merrill Jr., Inventor
By his Attorney A. M. Pierce.

UNITED STATES PATENT OFFICE.

GEORGE W. MERRILL, JR., OF BROOKLYN, NEW YORK, ASSIGNOR OF ONE-HALF TO ROBERT MERRILL, OF BROOKLYN, NEW YORK.

PHONOGRAPH OR GRAPHOPHONE.

SPECIFICATION forming part of Letters Patent No. 684,943, dated October 22, 1901.

Application filed January 31, 1900. Serial No. 3,437. (No model)

To all whom it may concern:

Be it known that I, GEORGE W. MERRILL, Jr., a citizen of the United States, residing in Brooklyn, Kings county, State of New York, have invented a new and useful Improvement in Phonographs or Graphophones, of which the following is a specification.

My invention relates especially to that class of devices wherein a recorder is employed for transferring to a record-cylinder sounds of any character or description and wherein a device is employed for reproducing such sounds, such as the phonograph and graphophone, and has for its object the provision of means and mechanism whereby record-cylinders of different diameters may be used upon one and the same instrument and in the provision of means for adjustably supporting and regulating the position of a recorder or reproducer in relation to such record-cylinders.

My invention also involves certain novel and useful combinations or arrangements of parts and peculiarities of construction and operation, all of which will be hereinafter first fully described and then pointed out in the claims.

In the accompanying drawings, forming a part hereof, Figure 1 is a front elevation of an instrument to which my invention is applied; and Fig. 2 is an end elevation looking from the right of Fig. 1, part of said figure being shown in section.

Similar numerals of reference wherever they occur indicate corresponding parts in both figures.

1 is the supporting-base of the instrument.

2 is a shaft mounted in a bearing 3 and carrying a mandrel 4, of the usual size and construction for the reception of a recording-cylinder 5, the diameter of which is indicated by the dotted lines, particularly in Fig. 2 of the drawings. When it is desired to employ a larger record, such as 6, the record 5 is removed and the secondary mandrel or sleeve 7 is slipped onto said mandrel 4.

In order to provide means for properly locating, adjusting, and holding the recorder or reproducer 8, I have provided a perpendicular rod 9, which adjustably fits into a sleeve 10, mounted upon the carrying-rod 11

of the instrument. This sleeve 10 is slotted at 12 at each side, and by means of a set-screw 13 and operating-nuts 14 thereon the rod 9 may be secured in any desired position. At the top of the rod 9 is mounted a yoke 15, from which extend two horizontal arms 16.

17 is a transverse bar having perforated ears 18 at each end, through which the rods 16 pass.

19 represents set-screws in the bar 17, which bear upon the rods 16. The transverse bar 17 carries a ring 20, swiveled upon ears 21, said ring receiving the tube 22, upon which the recorder or reproducer 8 is mounted and pressing against the tube 23 for the reception of a transmitting tube, horn, or the equivalent. Attached to the ring 20 is an arm 27, and to the bar 17 is an arm 24, said arm having a screw-threaded perforation for the reception of a screw 25, which engages with a spring 26, passing to the upper extremity of the arm 27. With this arrangement the bearing of the stylus upon the record-cylinder can be accurately adjusted by regulating the tension of the spring 26.

In order to provide means for throwing the stylus of the recorder or reproducer into and out of contact with the record-cylinder, I have provided a tube 28, pivoted to a projection 29 upon one side of a ring 30, which encircles the rod 11, the other side of the ring carrying a manipulating-arm 31. Adjustably secured by a set-screw 32 within the tube 28 is a rod 33, slotted at 34 for engaging with a pin 35, fixed in a projection 36 beneath the cross-bar 17. The extremity of the rod 33 bears against a lug or screw 37, projecting downward from the ring 20. When in the position indicated, the stylus of the reproducer 8 rests against the record 6; but by throwing the arm 31 downward the stylus will be raised therefrom. If a record, such as 5, is used and the support for the recorder or reproducer is to be lowered to the position shown by the dotted lines in Fig. 2 of the drawings, the rod 32 is telescoped into the tube 28 and held in the proper position by means of the set-screw 32.

It will thus be seen that I have provided means for adjustably supporting the recorder or reproducer in such a way that it may be

moved horizontally or vertically, such adjustments being independent of each other. I have also provided means for adjusting the bearing of the recording or reproducing stylus upon the record without interfering with its working when the machine is in operation and have also provided means for moving the support for the recorder or reproducer in two directions to facilitate the adjustment of the cutting-stylus to the most advantageous position and have adapted one machine to the use of record-cylinders of different diameters.

Having now fully described my invention, what I claim as new therein, and desire to secure by Letters Patent, is—

1. In a graphophone, the combination with the mandrel, of an upright post adjacent thereto, rods, 16, projecting from said post above the mandrel, a yoke slidably mounted upon said rods, a ring connected with said yoke by transverse pivots, a recorder, 8, car-

ried by said ring, means for moving the ring and recorder in an upward direction about said pivots, and spring-controlled means for limiting the downward movement of said ring and recorder about the pivots, substantially as set forth.

2. In a graphophone, the combination with the mandrel and the sleeve 10, of a vertically-adjustable rod, 9, the parallel, horizontal rods, 16, carried thereby, the cross-piece 17, slidably mounted on said rods, 16, a ring 20, pivotally supported by said cross-piece, 17, and the recorder carried by said ring, substantially as set forth.

Signed by me at New York this 27th day of January, 1900.

GEORGE W. MERRILL, JR.

Witnesses:

ROBT. MERRILL,
A. M. PIERCE.

No. 685,024.

Patented Oct. 22, 1901.

J. E. ALEXANDER.
TALKING MACHINE.

(Application filed Dec. 10, 1900.)

(No Model.)

3 Sheets—Sheet 1.

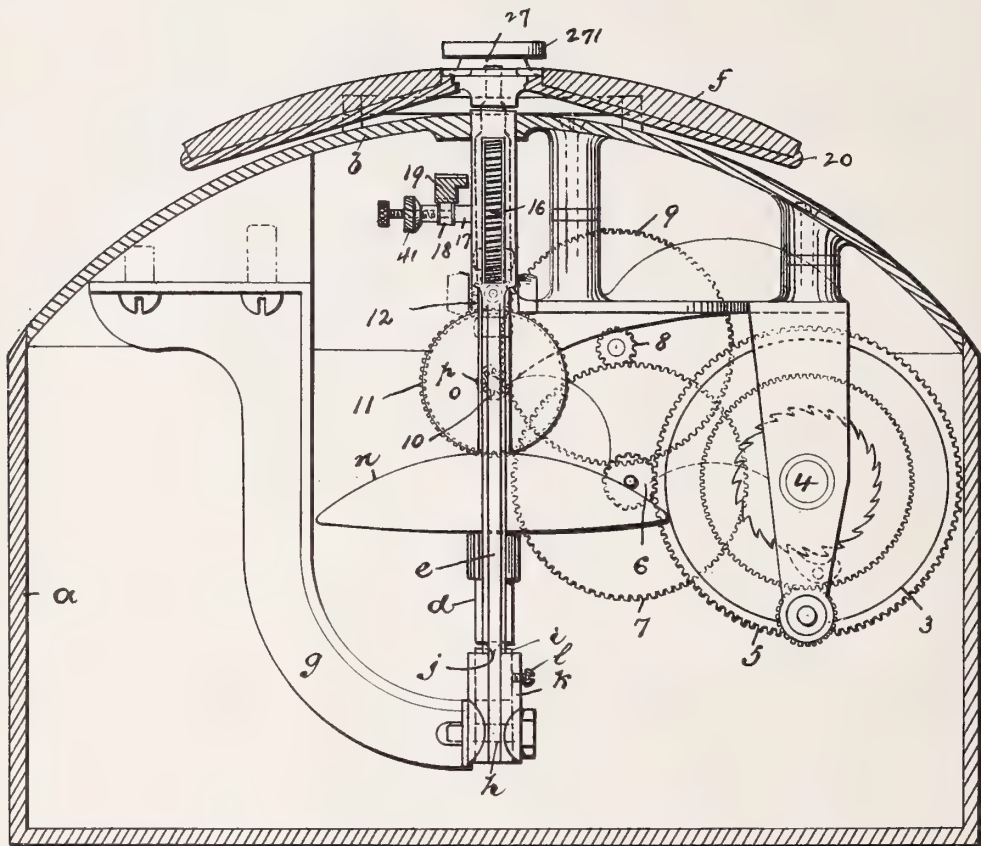


Fig. 1.

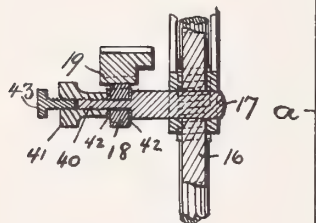


Fig. 2 1/2.

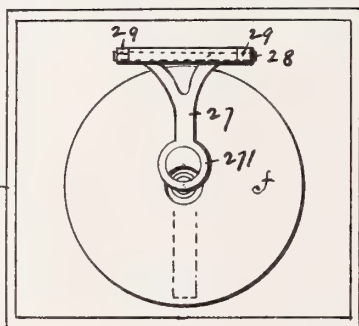


Fig. 2.

WITNESSES:

Henry King

Russell M. Everett.

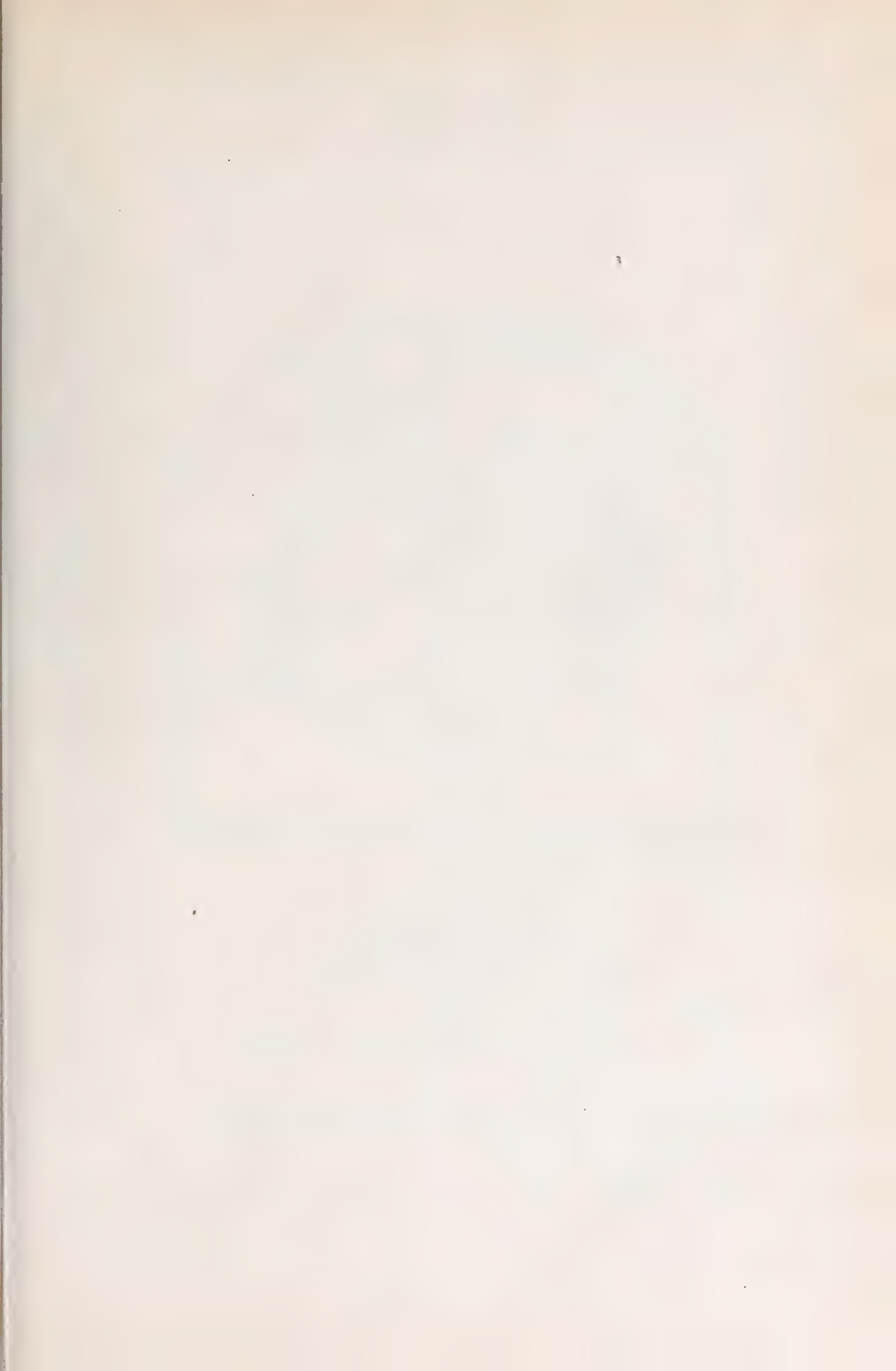
INVENTOR

John E. Alexander,

BY

Drake & Co.

ATTORNEYS.



No. 685,024.

Patented Oct. 22, 1901.

**J. E. ALEXANDER.
TALKING MACHINE.**

(Application filed Dec. 10, 1900.)

(No Model.)

3 Sheets—Sheet 2.

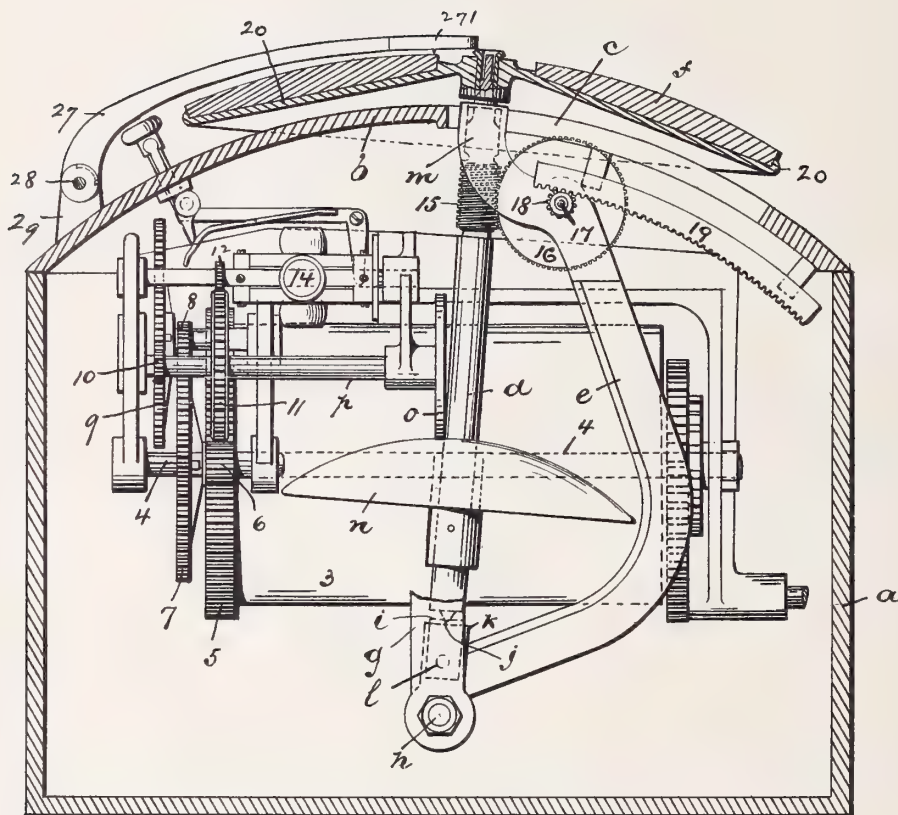


Fig. 3.

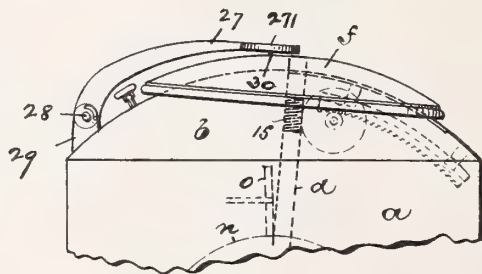


Fig. 4.

WITNESSES:

Henry King

Russell M. Everett.

INVENTOR:

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ATTORNEYS.

No. 685,024.

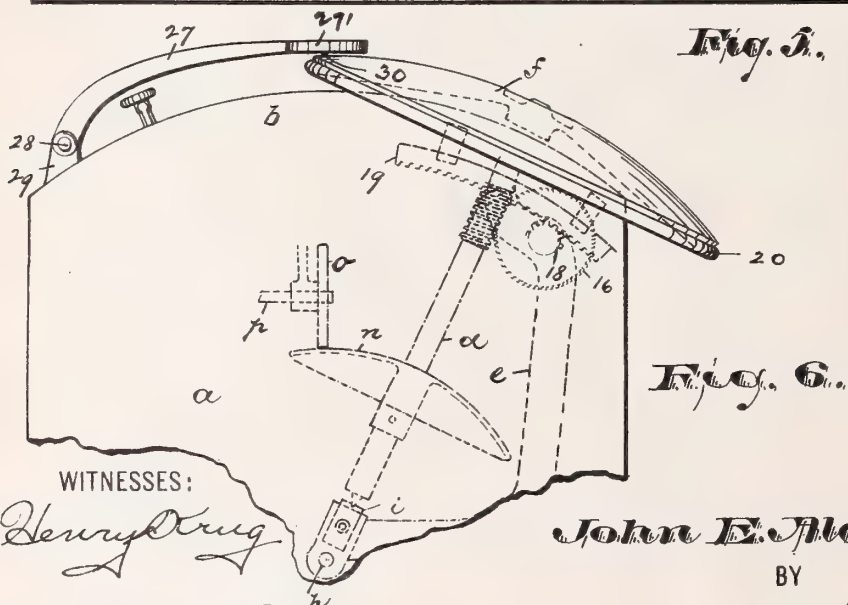
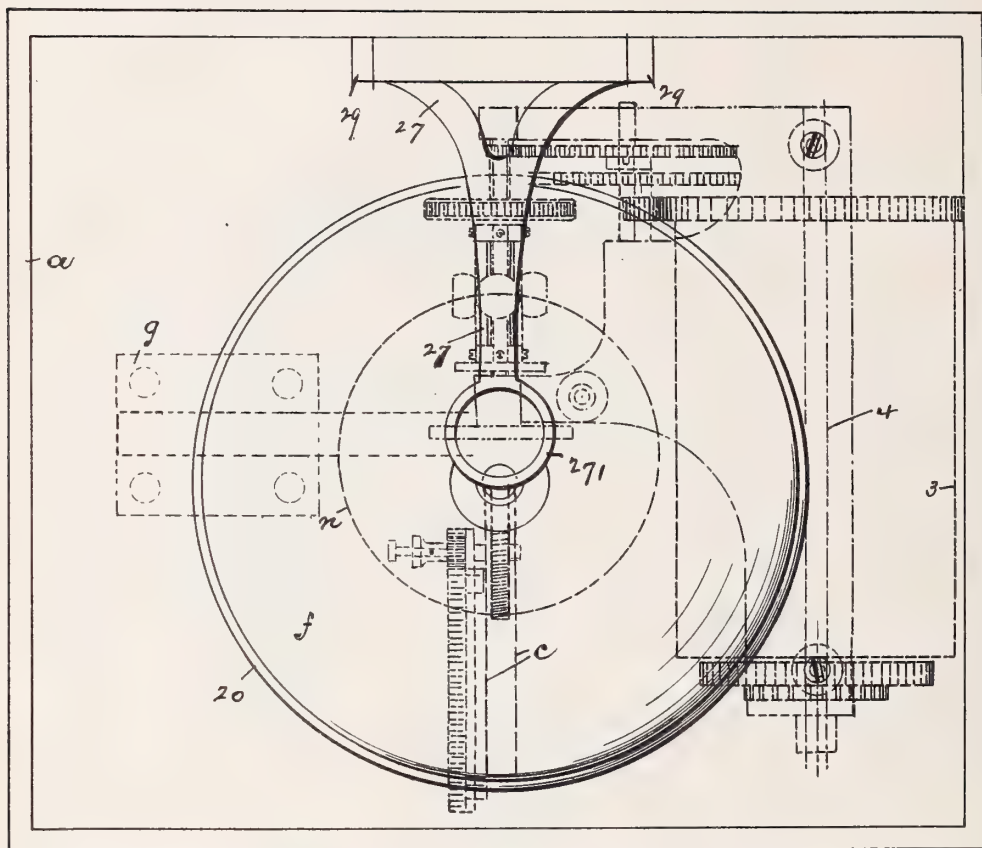
Patented Oct. 22, 1901.

J. E. ALEXANDER.
TALKING MACHINE.

(Application filed Dec. 10, 1900.)

(No Model.)

3 Sheets—Sheet 3.



WITNESSES:

Henry Dug
Russell M. Everett

INVENTOR

John E. Alexander,

BY

BY
Drake & Co.
ATTORNEYS.

UNITED STATES PATENT OFFICE.

JOHN E. ALEXANDER, OF NEWARK, NEW JERSEY, ASSIGNOR TO THE
GENERAL PHONOSPHERE CORPORATION, A CORPORATION OF NEW
JERSEY.

TALKING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 685,024, dated October 22, 1901.

Application filed December 10, 1900. Serial No. 39,347. (No model.)

To all whom it may concern:

Be it known that I, JOHN E. ALEXANDER, a citizen of the United States, residing at Newark, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Talking-Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to characters of reference marked thereon, which form a part of this specification.

This invention relates to certain improvements in that class of sound recording and reproducing or talking machines adapted to serve in connection with a record or record-blank having a spherical surface or a surface convexed in concentric relation to a given center after the fashion of the surface of a globe, of which class the machine shown in my prior application, filed September 28, 1900, Serial No. 31,357, is the only prior representative.

The object of the present construction is to secure greater compactness of structure in a machine of said class whereby greater convenience is obtained in operating in connection with said spherical or concentrically-curved records or record-blanks, to render the operation of said spherical recording device more simple and inexpensive, and to obtain other advantages and results, some of which may be referred to hereinafter in connection with the description of the working parts.

The invention consists in the improved sound recording and reproducing or talking machine and in the arrangements and combinations of parts of the same, all substantially as will be hereinafter set forth, and finally embraced in the clauses of the claim.

Referring to the accompanying drawings, in which like letters of reference indicate corresponding parts in each of the several views, Figure 1 is a side view of the improved machine, the box or case containing the working parts, the record-holder and record being shown in vertical section. Fig. 2 is a plan view, on a reduced scale, showing a speaker-

holder overlying the record. Fig. 2½ is a detail section showing a certain frictional pinion-clamp. Fig. 3 is a side view of the said machine, the box, the record, and its holder being again shown in section. Fig. 4 is a side view showing the machine in part on a reduced scale. Fig. 5 is a plan of the said machine, and Fig. 6 is a side elevation showing the record and holder in different positions from what are shown in Fig. 4.

In said drawings, *a* indicates the body of a suitable box or case within which the working parts of the machine are inclosed and by which the said working parts are protected from injury by mechanical interference, dust, or otherwise. The top of the body of said box or case is preferably a dome-shaped casting or plate *b*, providing bearings from which the working parts are suspended and held in operating relation and removable together from the body of the case. Said dome-shaped plate or casting *b* is slotted from at or near the center of the dome radially or laterally outward, as at *c*, to permit a sidewise movement of the record-holder shaft *d* and frame *e*, which have bearings within the box or case and extend out through said slot to receive the record-holder, so that it will lie near to the dome as it moves in a path concentric to the curvature of the dome. The said frame *e* has its lower bearing upon a bracket *g*, Fig. 1, secured within the box or case, preferably upon the dome-shaped casting or plate *b*, said frame being pivoted upon said bracket, as at *h*, so as to turn thereon, and near its pivot *h* said frame *e* preferably provides an adjustable bearing *i* for the lower or inner end of the shaft. Said adjustable bearing may be a short cylindrical piece of metal recessed at its upper end to receive a pivotal lug or center *j* at the lower end of the shaft, and it may fit within a tubular part *k* of the frame *e*, where it may be adjustably held by means of a set-screw *l* or other means. At its upper end said shaft *d* is arranged in a box or bearing *m*, prepared for it in the frame *e*, said bearing permitting a free rotation of said shaft as it turns with said frame, but holding it steadily and positively to prevent irregularity of rotary movement. Said shaft *d* is preferably provided at a suit-

able point in its length with a friction-surface *n*, which is preferably globular or convexly curved, after the fashion of the surface of a sphere, the convexity being concentric with the center of movement of the shaft and with the curved surface of the record. Said friction-surface is preferably formed upon a flange the general shape of which is that of a segment of a globe and is fastened upon the shaft *d* at a distance below the record-holder, and thus there is no necessity for a contact of the cooperating friction motive device bearing upon the record-holder, and thereby deadening the sound therefrom. The friction-surface is engaged by a friction-wheel *o* upon the shaft *p*, in train with the cog-wheels and cooperating mechanisms of a suitable motor, preferably a spring-motor. The convex friction-surface being concentric with the center of movement of the shaft *d*, the said friction-wheel *o* maintains its operative contact with said friction-surface as the said shaft moves with the frame on the pivot *h*. Said friction-wheel *o* may be of leather or other material having a measure of elasticity. The convex friction-surface in the preferred construction being concentric or approximately concentric with the surface of the record, as the shaft moves laterally in the plane of its longitudinal axis the distance between the friction-wheel and the axis of the shaft *d* gradually increased, so that the spirals described by the said friction-wheel *o* on the surface *n* gradually enlarge, as will be apparent, and the rate of speed of rotation of shaft *d* will be correspondingly reduced. This reduction of speed of the shaft *d* effects the speed of the record-holder and record, and thus this last-mentioned part rotates more slowly as the stylus enters into engagement with the parts of the globular or spherical record more distant from the center of rotation thereof, and thereby there is no hastening in the time or measures of sound production as the reproduction of the music or sound advances, but, on the contrary, the time is uniform throughout the reproduction.

The advantages due to the use of the improved record employed in this machine have already been detailed in my prior applications.

When a spring-motor is employed to effect the desired movements of the shaft and frame, the spring (not shown) may be contained within the barrel 3, being fastened at opposite ends upon said barrel and its shaft 4 in any suitable manner, and power may be transmitted through the cogs and pinions 5, 6, 7, 8, 9, and 10 to the friction-wheel. In train with the said motor-cogs I may employ a suitable governor 14 for regulating the speed, power being transmitted thereto by means of the cog-wheels 11 12 or by any other suitable means. The said shaft *d* near its free end is preferably threaded, as at 15, and engages a worm-wheel 16 on a shaft 17, having bearings upon the frame at a point adjacent to the threads

15, so that the threads of the shaft and worm-wheel intermesh, as indicated in Fig. 3. On the shaft 17, with the worm-wheel, is a pinion 18, which engages a curved or segmental rack 19, stationed beneath the dome and approximately concentric with the pivot *h*, so that the pinion will travel over the toothed surface of the rack as the frame *e* and shaft *d* move upon the pivot *h*, and thus as the shaft *d* rotates under the action of the friction-wheel *o* and the spherical or globular surface *n* the worm-wheel 16 slowly turns and causes the pinion 18 to travel over the rack 19 laterally and draw the frame *e* with it, so that said frame and the shaft *d*, the record-holder 20, and the record *f* on said holder are caused to move slowly, the shaft *d* moving in the slot *c* in one direction under the power of the spring of the motor or other motive means as the shaft *d* and the said parts connected therewith rotate.

Stationed at the top of the device and projecting over the record-holder and when the record is in place is an arm 27, arranged, preferably, on a pivotal pin 28 of a suitable bracket or bearing-plate 29, fastened to or formed on the case or plate *b*. At the projecting end of said arm 27 is formed a ring or other device 271 to receive and hold a speaker or sound-box having a stylus 30. (Indicated in Figs. 4 and 6.) Said arm 27 is free at its projecting end to gravitate, so that when the said speaker is disposed over the record its stylus 30 will engage the said record and contribute to the production of sound. After the shaft *d* and its connections have made a complete operative movement under the power of the spring-motor, so that the stationary stylus traversed the face of the record as said record is rotated and moved in a plane of its axis in a direction coincident with the longitudinal axis of the slot *c* to the end of said movements, the said record may be returned to its initial position by hand, and to permit this to be quickly accomplished I prefer to hold the pinion 18, which engages the rack 19, in operative position upon the shaft 17 by frictional clamping means, which are illustrated in Figs. 1 and 2¹, where the shaft 17 is shown to be reduced in diameter at one end, as at 40, and the reduced end is threaded to receive a clamping-screw 41. The pinion is arranged between friction-washers 42 42 on said reduced end of the shaft, so that when the clamp-screw is screwed up the pinion is clamped with sufficient firmness to secure the operations described, and yet permit a loose turning independent of its shaft when the frame *e*, shaft *d*, and connections are turned to their initial positions, as described. A lock screw or nut 43 may be employed to lock the clamping-screw 41, when properly adjusted, to secure the desired frictional contact.

Having thus described the invention, what I claim as new is—

1. In a sound recording and reproducing ma-

chine, the combination with a motor, of a rotary record - carrying shaft, and a frame carrying said shaft and movable about a center *h*, in the axis of rotation of said shaft, and means for transmitting motion from the motor to said frame and shaft, substantially as set forth.

2. In a sound recording and reproducing machine, the combination with a frame pivoted upon a suitable bearing in said machine, of a record-carrying shaft having its bearings on said frame, the pivotal center of movement of the frame being in the longitudinal axial line of said shaft and movable with said frame, means for rotating said shaft and means for moving said frame on its pivot, substantially as set forth.

3. In a sound recording and reproducing machine, the combination with a frame pivoted upon a suitable bearing in said machine, of a record-carrying shaft having its bearings on said frame near the opposite ends of the latter and having, intermediate of said ends, a screw-thread, a worm-wheel centered on said frame and engaging the threads of the record-carrying shaft, a pinion in connection with said worm-wheel and a curved rack engaged by said pinion, said curved rack being fixed in the machine adjacent to the free end of the shaft and the curvature of the rack being concentric with the center of movement of the frame, whereby, when the said pinion is turned with the worm-wheel, the said pinion will travel over said rack and will effect a turning of the frame on its pivot, substantially as set forth.

4. In a sound recording and reproducing machine, the combination with a frame movable on a center, of a rotary shaft journaled on said frame and adapted to turn therewith, and means in connection with the free end of the frame and receiving power from the said shaft for turning said frame, and a friction-surface on said rotary shaft, distant from the free end thereof, and independent of the record-holder, said record-holder secured to said rotary shaft at its free end, and a friction-wheel pressing on said friction-surface but not on the holder, and means for rotating the said friction-wheel, substantially as set forth.

5. In a sound recording and reproducing machine, the combination with a pivoted frame carrying a worm-wheel and pinions and a threaded shaft carrying a record with a spherical surface and a spherical friction-surface distant from said record, of a rack engaged by said pinion, the power from the shaft being transmitted to the pinion through said worm-wheel, and a friction-wheel for engaging said spherical friction-surface and rotating said shaft, substantially as set forth.

6. In a sound recording and reproducing machine, the combination with a pivoted frame carrying a rotary shaft arranged with its longitudinal axis in line with the pivotal center on which the said shaft turns and having screw-threads and movable in one direction

of turning under the power of a motor, of said motor and means for transmitting the power to said shaft and means for transmitting the power of the rotary shaft to the frame to effect a turning thereof on its pivot, substantially as set forth.

7. In a sound recording and reproducing machine, the combination with a dome-shaped box or case having a slot *c*, to permit the record-holder shaft to move with its record-holder, as said shaft turns about its pivotal center, said rotary shaft, means for rotating said shaft, means for turning said shaft and causing it to move a distance in a given plane and a record-holder arranged on said shaft distant from its center of turning, substantially as set forth.

8. In a sound recording and reproducing machine, the combination with the fixed speaker-holder, of a rotary record-holder and spherical record, together movable in a curved path adjacent to said speaker-holder, substantially as set forth.

9. In a sound recording and reproducing machine, the combination with a speaker having a suitable stylus, of a rotary record-holder on a movable axis and means for rotating said holder and changing the position of the axis and a spherical record arranged on said holder, substantially as set forth.

10. In a sound recording and reproducing machine, the combination with a speaker having a stylus, of a rotary record-holder movable in the plane of its axis, a flange arranged at a distance from but connected to rotate with said record-holder and a friction-wheel, and means for operating the same, said flange being engaged and rotated by said friction-wheel and thereby operating said holder, substantially as set forth.

11. In a sound recording and reproducing machine, the combination with a speaker having a stylus, of a rotary record-holder movable in the plane of its axis, in a curvilinear path, and a globular or spherical flange and friction-wheel for operating said holder, substantially as set forth.

12. In a sound recording and reproducing machine, the combination with the record-holder, of a shaft arranged at the axis of said holder, the longitudinal axis of the shaft, coinciding with the axis of said holder, a frame pivoted upon a suitable fixture and provided with journal-bearings for the shaft, one of said journal-bearings being arranged near the pivot of the frame, and the other of said bearings being near the free end of said frame, and means for rotating said shaft and means for turning the frame on its pivot, substantially as set forth.

13. In a sound recording and reproducing machine, the combination with the record-holder, of a rotary shaft arranged at the axis of said holder and supporting the same, the longitudinal axis of the shaft coinciding with the axis of the holder, a frame pivoted at a point in line with said longitudinal axis of

the shaft, and providing journal-bearings for said shaft, one of said bearings being near the frame-pivot and the other at a distance therefrom, said shaft having a friction-flange interposed between the said bearings, a friction-wheel engaging said flange and transmitting rotary motion thereto, and means for transmitting motion from the frame and turning said frame on its pivot, substantially as set forth.

14. In a sound recording and reproducing machine, the combination with a speaker-holder, of a rotary and laterally-movable record-holder, and a friction-flange arranged on the same axis with the holder at a distance from said holder, a friction-wheel engaging said flange, and a motor, substantially as set forth.

15. In a sound recording and reproducing machine, the combination with a stationed speaker or sound-box holder, of a rotary and laterally-movable record-holder having a spherical friction-surface, connected therewith, and on the same axis, a friction-wheel engaging the said spherical surface and a motor, substantially as set forth.

16. The combination with the box or case of a frame pivoted in said case and movable at its free end in a straight course on its pivot, of a rotary shaft having bearings on said frame near said pivot, and at its free end being adapted to carry a record, a speaker-carrying arm, attached to said box or case, and a motor for rotating said shaft and turning the frame on its pivot in one direction, the motive means and connections permitting a return of the record, its shaft and frame to an initial position by hand-power, substantially as set forth.

17. In a machine for recording and reproducing sounds, the combination with a curved rack fixed in said machine, a frame *e*, pivoted at a distance from said rack and having a free end adjacent to said rack and movable in a path concentric with the curvature of said rack, and carrying a shaft 17, carrying said pinion, a worm-wheel on said shaft 17, clamping means for said pinion, said frame *e*, having bearings for a threaded record-holding shaft, and said shaft adapted to receive said record, substantially as set forth.

18. In a machine for recording and reproducing sound, the combination with the curved rack fixed immovably in said machine, of a frame pivoted concentric with said curved rack and carrying a record-holding shaft having a screw-thread, a pinion and worm-wheel joined together, one engaging said rack and the other threads of the record-carrying shaft, substantially as set forth.

19. In a machine for recording and reproducing sound, the combination with the curved rack, of a pivotal frame carrying a record-holding shaft, said shaft having a screw-thread, a pinion and worm-wheel movable together when clamped and independent of one another when not clamped, and a friction-clamp for normally holding said pinion and worm-wheel in operative relation, substantially as set forth.

In testimony that I claim the foregoing I have hereunto set my hand this 5th day of November, 1900.

JOHN E. ALEXANDER.

Witnesses:

CHARLES H. PELL,
LOUIS A. GREENLEAF.

1871

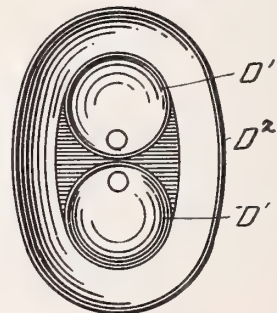
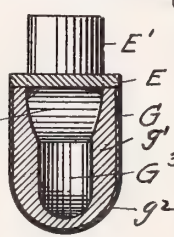
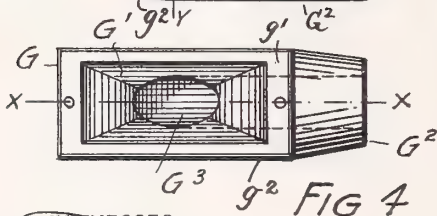
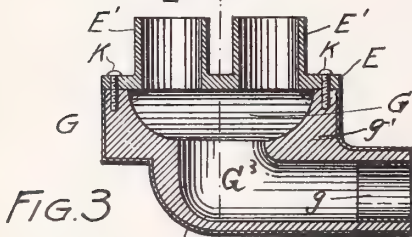
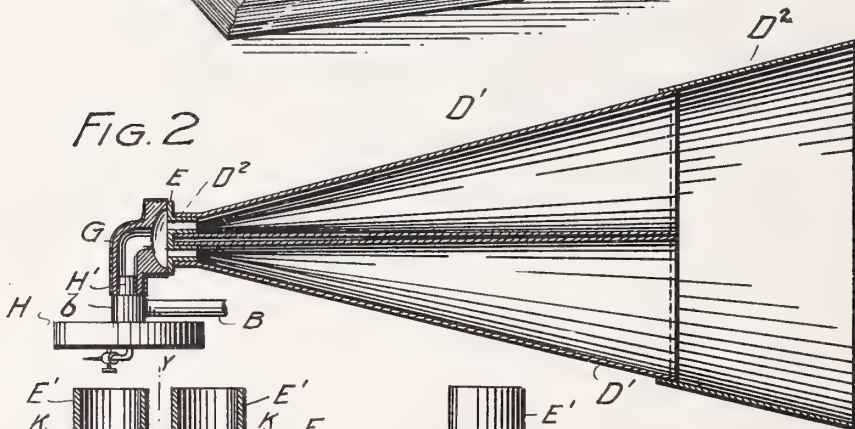
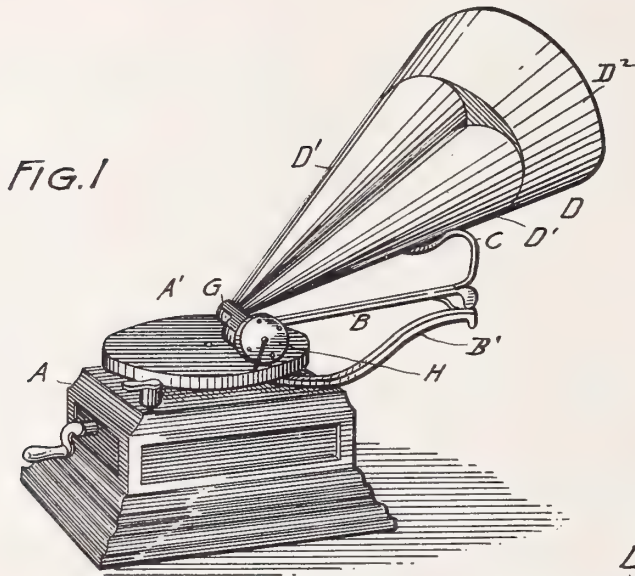
No. 685,409.

Patented Oct. 29, 1901.

G. OSTEN & W. P. SPALDING.
SOUND RECORDING AND REPRODUCING MACHINE.

(Application filed Jan. 29, 1901.)

(No Model.)



WITNESSES:

John J. Dolan et al.
Wm. J. ...

INVENTORS:
George Osten and
William P. Spalding
BY *Phyllis ...*
ATTORNEY.

UNITED STATES PATENT OFFICE.

GEORGE OSTEN AND WILLIAM P. SPALDING, OF DENVER, COLORADO.

SOUND RECORDING AND REPRODUCING MACHINE.

SPECIFICATION forming part of Letters Patent No. 685,409, dated October 29, 1901.

Application filed January 29, 1901. Serial No. 45,238. (No model.)

To all whom it may concern:

Be it known that we, GEORGE OSTEN and WILLIAM P. SPALDING, residents of Denver, Colorado, have invented a new and useful Improvement in Sound Recording and Reproducing Machines, which invention is fully set forth in the following specification.

While our invention has reference generally to sound recording and reproducing machines, it relates more particularly to improvements in the horn and to a transmitting or conducting device for conveying the reproduced sounds from the reproducer to the horn, and has as its object to improve the tone quality and power of sounds reproduced from waves recorded upon sound-records, to reproduce said sounds in a perfectly natural tone and with the full power and melody of the original voice or voices or instrument or instruments used in making the original sound-records, to overcome everything foreign to the reproduction of perfect music, vocal or instrumental, and in general to reproduce with original volume, melody, and power every sound of whatever nature recorded in sound-records.

Although the improvements constituting the invention are specially adapted for employment in connection with machines of the zonophone or gramophone type, they may also be used on other types of talking-machines, such as the graphophone.

The improvements whereby we attain, at least to a maximum degree, the objects above recited will be most readily understood by reference to the accompanying drawings, illustrating the preferred embodiment of the invention.

In said drawings, Figure 1 is a perspective view illustrating the invention as applied to a machine of the zonophone type. Fig. 2 is a longitudinal sectional view through the horn and transmitter. Fig. 3 is an enlarged sectional view through the conveyer. Fig. 4 is a detail view of part of the transmitter, the cover being removed. Fig. 5 is a section on line Y Y, Fig. 3; and Fig. 6 is an end view of the horn.

Referring to the drawings, A represents the casing, which incloses the usual motor mechanism for rotating a platen A', upon which a disk sound-record is adapted to be secured. B is a swinging arm supported at its outer

end by a bracket B' in such manner that its inner end will be free to vibrate or move vertically as well as laterally. At said inner end arm B is formed with a sleeve or collar b, Fig. 2. H is a reproducer of the usual construction, having a short tubular part H', through which the reproduced sounds pass from the diaphragm-chamber. Tubular part H' fits closely in and projects from sleeve b. A horn-support C is secured at one end to arm B.

The parts as thus far described are of well-known construction and form no part of the present invention.

A single horn or bell is ordinarily used in zonophones, gramophones, and graphophones for discharging the sounds from the reproducer, the small end of the horn being connected with the short tube of the reproducer either directly or by the interposition of a rubber tube connection. It has also been proposed to use two horns communicating with opposite sides of the reproducer-diaphragm and having their discharge ends arranged side by side. Furthermore, it has been proposed to employ a plurality of independent horns mounted upon a part to which a rotary movement is imparted. Our construction of horn about to be described differs from these arrangements in material and important respects, as will be readily understood.

D represents our improved horn in its entirety, the same being made up of two hollow conical tubes (or single horns) D' D', attached together along one side in any suitable manner, (as by soldering or riveting,) and a single bell or hood D², secured to and closed in about the larger or discharge ends of both conical tubes D' D'.

Instead of having the smaller ends of the parts D' D' communicate directly with the diaphragm-chamber of the reproducer we interpose what is herein termed a "transmitter," the function of which will be referred to later.

G is the transmitter. It has an elongated sound concentrating and distributing chamber G', the walls of which curve inwardly toward the passage G' at about the middle thereof, so that the line Y Y, Fig. 3, divides the chamber (as well as the opening) into two equal parts. Immediately to the rear of cham-

ber G' passage G^3 bends at right angles and extends through an arm G^2 . The outer end of the passage through the arm G^2 is lined with an aluminium ring or sleeve g , preferably of a length just equal to the length of tube H' , which projects from collar b . Said projecting end of tube H' fits closely and bears within said sleeve g when the parts are assembled, as clearly shown in Fig. 2, and it has been found by extensive experimentation that the interposition of the aluminium sleeve enables us to attain tone quality which it is impossible to attain without said sleeve or with a sleeve made of other metals—such as tin, brass, or iron—or of materials such as rubber, paper, or the like. The action of the transmitter may also be improved by making the same in the form of a metal shell g^2 and filling or coating the interior of the shell with a mixture of best glue with best cement applied in a plastic condition. This filling g' when dry is painted over with a solution of white shellac and alcohol. The surface thus formed possesses superior resonant qualities.

The action of the horn and transmitter is as follows: The reproduced sounds pass from the tube H' of the reproducer into the passage G^3 of the transmitter, which passage acts as does the human throat, discharging the sounds into the chamber G' , which may be said to correspond in function to the human mouth. The walls of the chamber G' and of passage G^3 , adjacent to said chamber, act (like the roof of the mouth) as a sounding-board to increase the volume of the sound which is concentrated in chamber G' , and from whence it passes in approximately equal proportions through tubes or spuds $E' E'$ into the conical tubes $D' D'$. As the combined vibratory properties of the two tubes $D' D'$ greatly exceeds the vibratory properties of a single larger conical tube of approximately the same length, the aggregate strength of the sound-vibrations emitted by the plurality of tubes will of course greatly exceed in strength and volume, and therefore in carrying power, the sound-vibrations that would be emitted by a single large tube (or horn.) Any double-sound effect that may otherwise be produced by the sounds coming from the two tubes $D' D'$ is avoided by the action of the single bell or hood D^2 , into which both of said tubes discharge, said ball causing the sounds coming from the separate tubes to blend together before they are finally discharged from the horn.

While we have herein shown and described what is regarded as the best practical embodi-

ment, it is to be understood that our invention is not confined to the precise construction illustrated, as modifications may be made within wide limits without departing therefrom. Thus instead of two conical tubes or small horns $D' D'$ three or more may be employed. Furthermore, while the invention has been described with special reference to the reproduction of sounds it may also be used to great advantage in recording sounds, a recorder being substituted for the reproducer H .

What we claim as our invention is—

1. The combination with a sound reproducer or recorder, of a multiple horn consisting of a plurality of small horns all communicating at their smaller ends with one and the same reproducer or recorder and a hood or bell common to all of the small horns and into which said small horns discharge or from which they receive the sounds at their larger ends.

2. The combination with a sound reproducer or recorder, of a multiple horn comprising a plurality of small horns, and a transmitter having a chamber or mouth with which the small horns communicate at their smaller ends and a throat leading from said chamber or mouth to the diaphragm-chamber of the recorder or reproducer.

3. The combination of a sound recorder or reproducer, a multiple horn consisting of a plurality of small horns and a hood or bell embracing all of the small horns at their larger ends, and a transmitter having a chamber or mouth with which the small horns communicate at their smaller ends and a throat leading from said chamber or mouth to the diaphragm-chamber of the recorder or reproducer.

4. The combination with a reproducer or recorder and a horn, of a transmitter comprising a passage or throat and a chamber or mouth discharging into the horn, the throat leading at one end to the diaphragm-chamber of the reproducer or recorder and at its other end opening into the mouth, and a resonant covering for the walls of the throat and mouth consisting of a mixture of cement and glue.

In testimony whereof we have signed this specification in the presence of two subscribing witnesses.

GEORGE OSTEN.
WM. P. SPALDING.

Witnesses:

T. E. JENKINS,
C. A. BERDEL.

105.429

No. 685,429.

Patented Oct. 29, 1901.

G. OSTEN & W. P. SPALDING.
DIAPHRAGM FOR ACOUSTICAL APPARATUS.

(Application filed Feb. 5, 1901.)

(No Model.)

Fig. 1.



Fig. 2.

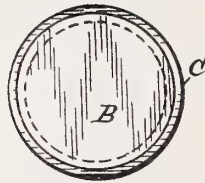


Fig. 3.



Fig. 4.

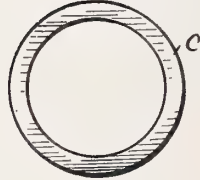
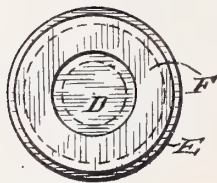


Fig. 5.



Witnesses
W. R. Edelen.
[Signature]

Inventors
George Osten & W. P. Spalding
by *[Signature]*
their attorney

UNITED STATES PATENT OFFICE.

GEORGE OSTEN AND WILLIAM P. SPALDING, OF DENVER, COLORADO.

DIAPHRAGM FOR ACOUSTICAL APPARATUS.

SPECIFICATION forming part of Letters Patent No. 685,429, dated October 29, 1901.

Application filed February 5, 1901. Serial No. 46,129. (No model.)

To all whom it may concern:

Be it known that we, GEORGE OSTEN and WILLIAM P. SPALDING, residents of Denver, Colorado, have invented a new and useful
5 Improvement in Diaphragms for Acoustical Apparatus, which invention is fully set forth in the following specification.

The object of this invention is to provide a diaphragm for use in the recorders and re-
10 producers of sound recording and reproducing apparatus, which will possess vibratory properties of superior delicacy and accuracy, enabling sounds to be truthfully recorded and reproduced even as to their minutest details.

15 This object is attained by making the diaphragm, either in whole or in part, of a specially-prepared paper, such as hereinafter described. The paper, preferably wood-pulp paper, is first submerged in a solution of bicarbonate of soda in distilled water, where it
20 is allowed to remain for several hours in a warm place. The effect of this solution is to neutralize or destroy all foreign matter in the paper which would be detrimental to its vi-
25 bratory properties. At the same time the paper by absorbing the solution acquires a leather-like toughness. After its removal from the bicarbonate solution the paper is submerged for several hours in distilled water
30 for cleansing purposes. The paper is next submerged and let stand for an hour or more in a solution of chlorid of gold—from one to one and a half ounces of distilled water to two
35 or three grains of chlorid of gold. After removal from the gold solution and drying the paper is placed in a solution of from one hundred and fifty to two hundred grains of nitrate of silver and one to two grains of cyanid of potassium in one and a half to
40 two ounces of distilled water and let remain for from five to eight hours. The effect of the gold and silver solutions is to thoroughly impregnate the paper with deposits of these
45 metals, imparting thereto the desired metallic properties. The cyanid of potassium acts to cause the paper to absorb the solution more readily and quickly. After the paper is removed from the silver solution and has become nearly but not entirely dry it is
50 placed between two pieces of perfectly clean paper and covered with a warm smooth heavy weight—for example, an ordinary

smoothing-iron for clothes—until thoroughly dry, when it is placed where air can circulate about it.

In order to preserve the paper from effects
55 of the weather, either wet or dry, cold or heat, an oily substance, such as pure white wax, is applied thereto. The oily substance also has the effect of removing excessive metallic
60 sounds.

It will of course be understood that the proportions of the materials with which the paper is treated may be varied as desired and that the procedure may be varied within wide
65 limits, the principal purpose being to impart to the paper the leather-like toughness and metallic properties.

While paper is preferred, other suitable fibrous materials treated in the manner above
70 indicated may be employed in the construction of diaphragms according to the invention. In utilizing this specially-prepared paper or fibrous material in the construction of diaphragms for acoustical apparatus the vibra-
75 tory body or part, which is made of said material, may constitute the whole or only a part of the diaphragm, greatly improved results being attained in either case.

The accompanying drawings illustrate sev-
80 eral forms of diaphragms embodying this invention.

Figure 1 is a plan view of a diaphragm made entirely of the specially-prepared pa-
85 per. Fig. 2 is a plan view of another form of diaphragm. Figs. 3 and 4 are details illustrating the paper center and supporting ring, respectively, of the diaphragm of Fig. 2; and Fig. 5 is a plan view of still another form of
90 diaphragm.

As already stated, the diaphragm A of Fig. 1 is made entirely of the specially-prepared paper.

In the diaphragm of Figs. 2, 3, and 4 the vibratory body B is made of the specially-
95 prepared paper and cemented to an outer supporting ring or frame C, of suitable material, preferably of mica. The cement used is preferably a paste of white shellac and alcohol. In applying the paste the edge of the
100 paper center B is roughened where it overlaps the ring C, so that the cement will take hold. The mica ring serves as a bearing for the means for clamping the diaphragm in

place in a recorder or reproducer and is less likely to be injured than if the clamping means acted directly upon the paper.

In Fig. 5 the diaphragm consists of a body or annulus F of the specially-prepared paper. Annulus F is cemented at its inner edge to a central plate D, of very thin metal, and at its outer edge to a supporting-ring E, of mica, metal, or other suitable material.

Although specially designed for use in sound recording and reproducing apparatus, diaphragms embodying this invention may be employed in other apparatus where diaphragms are adapted to be acted upon by sound vibrations.

What we claim is—

1. In acoustical apparatus, a vibratory body consisting of fibrous material impregnated with metal.

2. A vibratory body for acoustical apparatus consisting of fabric of fibrous material impregnated with metal.

3. In acoustical apparatus, a vibratory body consisting of paper impregnated with metal.

4. In acoustical apparatus, a vibratory body consisting of toughened fibrous material impregnated with metal.

5. In acoustical apparatus a vibratory body consisting of toughened paper impregnated with metal.

6. A vibratory body for use in acoustical apparatus consisting of paper impregnated with gold and silver.

7. A vibratory body for use in acoustical

apparatus consisting of toughened paper impregnated with gold and silver.

8. A vibratory body for use in acoustical apparatus consisting of paper toughened by the action of a solution of bicarbonate of soda and impregnated with gold and silver by the action of a solution of chlorid of gold and a solution of nitrate of silver.

9. A vibratory body for use in acoustical apparatus consisting of toughened paper impregnated with metal, and having applied thereto an oily substance.

10. A diaphragm for use in acoustical apparatus consisting of a vibratory body of toughened fibrous material impregnated with a metal and having a supporting-frame around its outer edge.

11. A diaphragm for use in acoustical apparatus consisting of a vibratory body of fibrous material impregnated with a metal having a supporting-frame around its outer edge and a thin metallic central plate.

12. In a diaphragm for use in acoustical apparatus, an annular vibratory body of toughened fibrous material impregnated with a metal having a thin metallic central plate.

In testimony whereof we have signed this specification in the presence of two subscribing witnesses.

GEORGE OSTEN.

WM. P. SPALDING.

Witnesses:

MARY JONES,

JESSIE D. THOMPSON.

1112

No. 685,712.

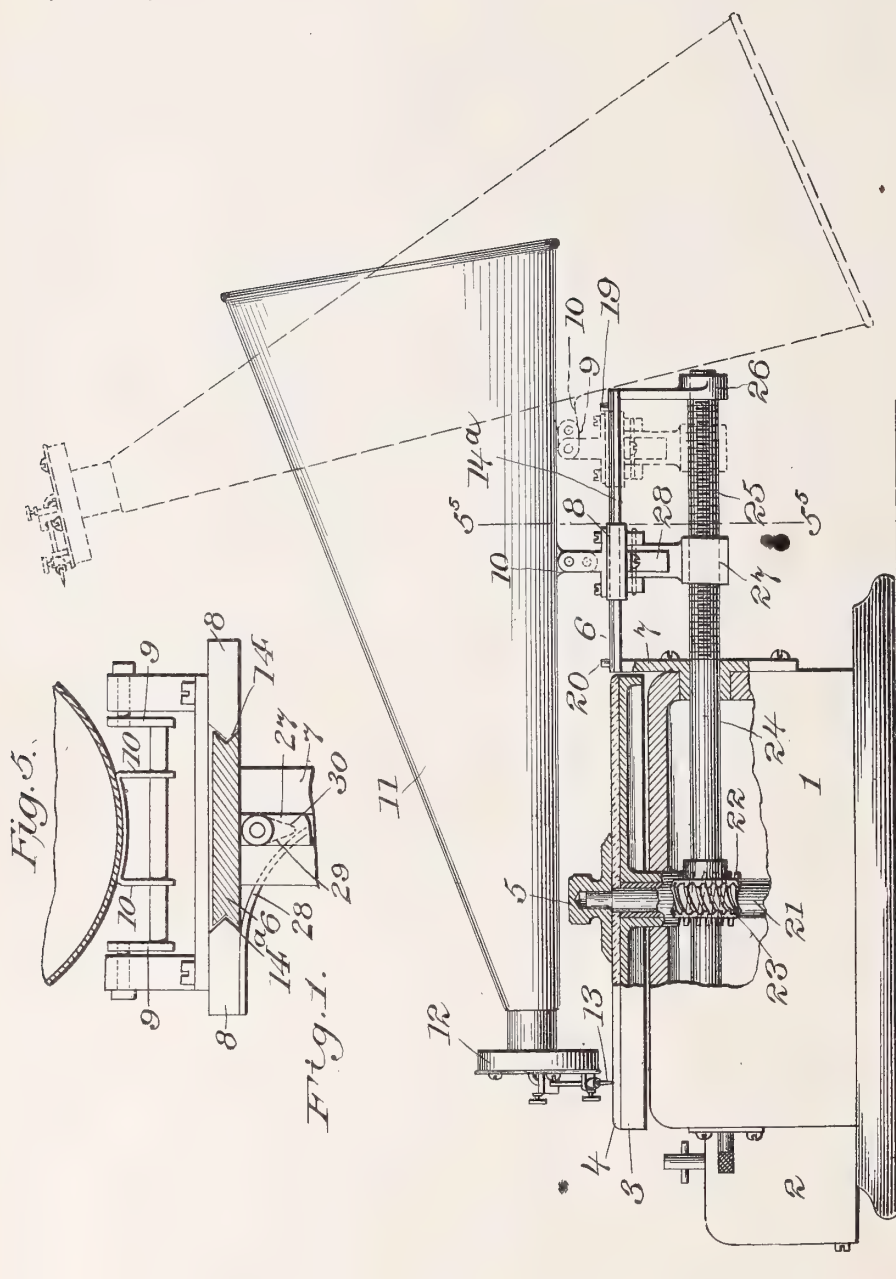
Patented Oct. 29, 1901.

G. K. CHENEY.
SOUND REPRODUCING APPARATUS.

(Application filed Dec. 15, 1899.)

(No Model.)

2 Sheets—Sheet 1.

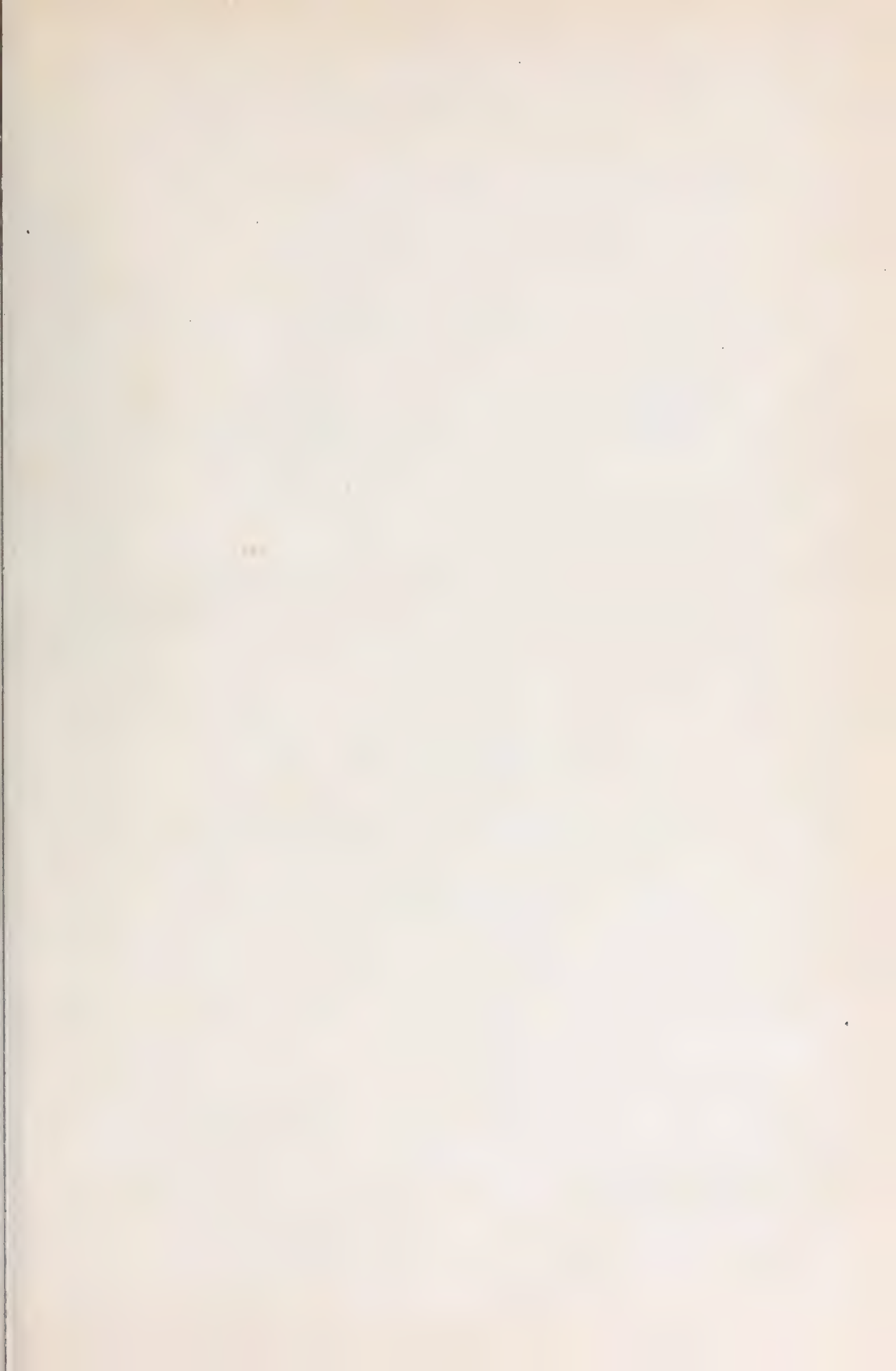


WITNESSES:

Thos. J. Smith
W. H. Humphrey -

INVENTOR

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No. 685,712.

Patented Oct. 29, 1901.

G. K. CHENEY.
SOUND REPRODUCING APPARATUS.

(Application filed Dec. 15, 1899.)

(No Model.)

2 Sheets—Sheet 2.

Fig. 2

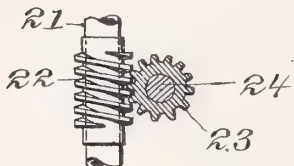


Fig. 3.

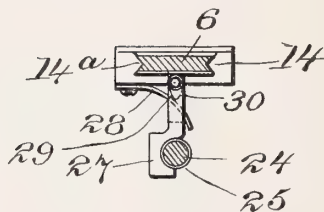
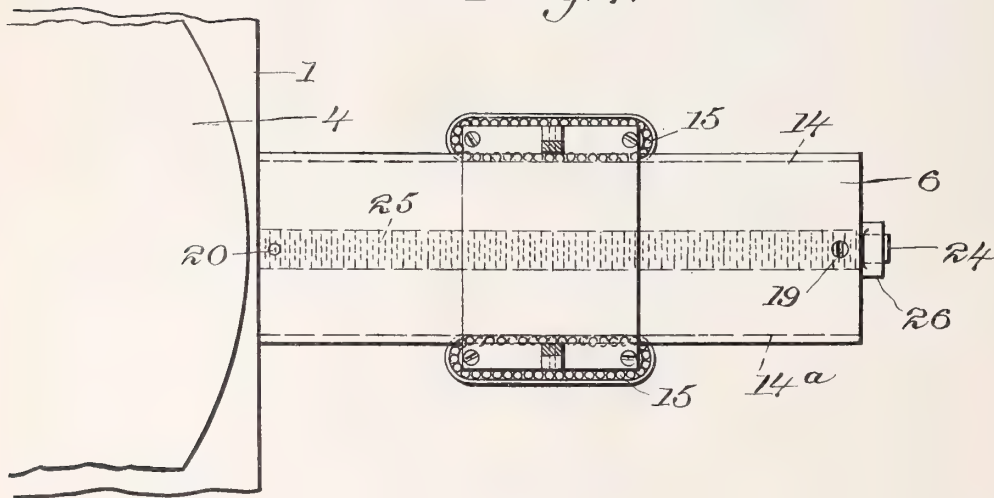


Fig. 4.



WITNESSES

Thos. T. Smith.
W. H. Humphrey.

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BY
W. H. Humphrey
ATTORNEY

UNITED STATES PATENT OFFICE.

GEORGE K. CHENEY, OF NEW YORK, N. Y., ASSIGNOR TO NATIONAL
GRAMAPHONE CORPORATION, OF NEW YORK, N. Y.

SOUND-REPRODUCING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 685,712, dated October 29, 1901.

Original application filed February 23, 1899, Serial No. 706,448. Divided and this application filed December 15, 1899.
Serial No. 740,405. (No model.)

To all whom it may concern:

Be it known that I, GEORGE K. CHENEY, a citizen of the United States of America, and a resident of New York, county of New York, State of New York, have invented certain new and useful Improvements in Sound-Reproducing Apparatus, of which the following is a specification.

My invention relates to talking-machines, and comprises an improved reproducing apparatus designed to use a horn and to form a more compact and handy structure than has heretofore been usual where horns have been employed.

The present application is a division of my application Serial No. 706,448, filed February 23, 1899.

A special advantage of my invention resides in the fact that it may be manufactured largely out of stock materials and applied to the ordinary gramophone as at present built for the market, the long projecting swinging arm-support, however, being done away with.

The preferred form of apparatus embodying my invention is disclosed in the accompanying two sheets of drawings, in which—

Figure 1 is a side elevation and partial section of a gramophone with my invention attached thereto. Fig. 2 is a detail showing the manner in which the feed-screw is geared to the main shaft. Fig. 3 is a detail showing the manner in which the reproducer-carriage is geared to the feed-screw. Fig. 4 is a detail of a modification, showing ball-bearings provided for the reproducer-carriage. Fig. 5 is a detail cross-sectional view taken on the line S⁵ S⁵ of Fig. 1.

Throughout the drawings like reference-figures refer to like parts.

The apparatus consists of the box 1, containing the ordinary gramophone driving-gear driven by clockwork located in the extension-casing 2. There is the usual rotating table 3, carrying the disk-shaped record 4, which is held in place by a thumb-screw 5. A rectilinear guide-plate 6 has a right-angled lug 7, by which it can be screwed to the side of the motor-casing, as shown. On this guide-plate is mounted the sliding carriage 8, which has uprights on which is journaled a swinging link 9. At the lower end of this swing-

ing link is pivoted a projection 10 from the horn 11. At the small end of the horn are an ordinary sound-box 12 and reproducer-stylus 13. The guide-plate 6 preferably has grooves 14 14^a in its edges, along which grooves the reproducer-carriage slides. Stops 19 and 20 for limiting the motion of the carriage are located at the extremities of the rectilinear guide 6, and one of these stops 19 is so located that when the carriage strikes against it the projection 10 on the horn and the swinging link 9 will when extended be just long enough to permit the horn to swing up into an approximately vertical position before its side strikes against the end of the guide-plate.

The worm 22 is formed on the rotating sleeve 21, which drives the turn-table, and this worm meshes with a worm-wheel 23 on a horizontally-extending shaft 24. The outer portion of this shaft has a feed-screw 25 cut thereon, and its outer extremity is journaled in a bearing 26, extending down from the outer end of the guide-plate 6. A projection from the sliding carriage 8 meshes with this screw, and consequently as the table and record rotate the carriage is positively fed to the right, (looking at Fig. 1.) The preferred form of gear with said feed-screw is illustrated in detail in Fig. 3, and consists of a swinging half-nut 27, held in or out of engagement with the feed-screw by a yielding pressure device, such as the plate-spring 28, bearing on one of the beveled surfaces 29 and 30, formed on the swinging arm which supports the half-nut. When the half-nut is swung to the left, (looking at Fig. 3,) the plate-spring will bear on the right-hand beveled surface 30 and hold the nut out of engagement with the feed-screw, so that the carriage can be run back.

In the modification shown in Fig. 4 ball-bearings 15 run between the grooves 14 14^a in the edges of the plate and corresponding grooves on the overhanging portions of the sliding carriage 8. The balls are guided around the exterior of said overhanging portions of the carriage 8 by the guides 16, so that there is a closed circuit or loop-shaped channel for the balls to run around in, as in any ordinary ball-bearing, except that in this case the channel is in the form of a flattened loop

instead of being circular, as in the ordinary bicycle-bearing.

The method of operation of my invention is as follows: The reproducer being in the position shown in full lines in Fig. 1 and the table 3 being set rotating, carrying with it the disk-shaped sound-record, the hinged joint will allow the reproducer-stylus to run lightly in the groove of the sound-record.

The reproducer, however, not being mounted on a universal joint, is incapable of motion sidewise and will not be moved by the rotation of the table except as it moves slightly up and down to accommodate any irregularities produced by warping of the disk-shaped record. This feature of my invention, however, is not herein claimed, as the same is described and claimed in my pending application, Serial No. 706,448, above referred to.

As the mechanism rotates it also rotates the feed-screw 25, which meshes with the half-nut 27 and positively feeds the reproducer along a line radial to the disk-shaped record. The flexible mounting for the reproducer formed by the swinging link 9 coöperates with this positive feed motion to compensate for any slight irregularities between the motion given to the carriage by the feed mechanism at any one instant and the rate of motion transmitted to the reproducer by the record-groove at the same instant. As the ratio of the number of threads to the inch on the feed-screw to its number of revolutions per minute will be of course made equal to the ratio existing between the number of grooves to the inch on the sound-record and the number of revolutions per minute of such sound-record, there will be no substantial difference between the distance traveled by the reproducer-needle and the sliding carriage during the reproduction of an entire record; but temporary inequalities may arise on account of imperfections in the feed mechanism or in the record, and the special object of the flexible mounting above described is to allow for this and to prevent the record being ruined or the mechanism jammed, so that the clockwork might not have sufficient power to drive it further. Moreover, when a new needle is to be put in the sound-box or a new record is to be put in place on the revolving table the swinging link connection allows the horn and sound-box to be tipped up into the position shown in dotted lines in Fig. 1, thus leaving the other parts of the instrument exposed for the removal and replacement of the record and placing the sound-box in a convenient position for the insertion of a new needle.

When the reproduction of the record is completed, the hinged half-nut 27 is pulled out of engagement with the feed-screw 25 and held out of engagement by the plate-spring 28 while the carriage is slid back to the initial position.

The advantages of my invention are evident in its compact form and reduction of the

number of parts. Moreover, the horn and stylus and sound-box are little liable to injury when being lifted off the record, because they are supported in the position shown in dotted lines, whereas with the present form of machine the reproducer is liable to be dropped on the record or on the table at the side of the machine while it is being swung to one side. Moreover, my arrangement permits of more nearly balancing the reproducer on its hinge, so that the stylus will not be forced down into the bottom of the groove with the whole weight of the apparatus, thus producing a scratching sound, resulting from the dragging of the stylus along the bottom of the groove.

The essential parts of my invention can be sold as an attachment for the present style of gramophone, the guide-plate 6 being simply fastened to the motor-casing of the present gramophone by means of the lug 7 and the worm 22 being slipped over the rotating sleeve 21.

Another advantage is that my construction permits the horn to extend straight out from the sound-box and at right angles to the diaphragm, whereas other constructions have compelled the sound to be carried around the corner created by the right-angled bend in the horn. The positive feeding mechanism prevents the carriage sticking and the needle cutting across the record, thereby ruining the same.

A further advantage of the modification shown in Fig. 4 lies in the reduction of friction to the lowest point. This is important, inasmuch as the addition of a positive feed mechanism throws additional work upon the motor, and unless care is taken to reduce friction at every point to the lowest degree possible a more powerful driving-spring is required, and this adds to the cost of the machine and also to the difficulty of winding it up.

It is evident, of course, that various changes could be made in the details of construction of the apparatus. The guide-plate might be otherwise attached to the machine. Other forms of sliding carriage might be employed. Other means of hinging the reproducer to the carriage might be substituted. A different arrangement of feed-screw might be employed, which should be geared to the driving mechanism by other forms of mechanism. Other means might be substituted for conveying the motion from the feed-screw to the reproducer-carriage. All these modifications, however, I should still consider within the spirit and scope of my invention.

Having, therefore, described my invention, what I claim as new, and desire to protect by Letters Patent, is—

1. The combination of the rotating sound-record, the reproducer, the sliding carriage, the hanging link journaled on the carriage and hinged at its lower extremity to the re-

producer together with the rectilinear guide for the sliding carriage at right angles to the axis of the hinge.

2. The combination of the rotating sound-
5 record, the reproducer, the sliding carriage, the hanging link journaled on the carriage and hinged at its lower extremity to the reproducer together with the rectilinear guide for the sliding carriage at right angles to the
10 axis of the hinge, and the positive feed mechanism for said carriage.

3. A flexible mounting for a reproducer for a talking-machine comprising the combination of a guide, a carriage sliding thereon and
15 nearly to the end thereof, a swinging link hinged to said carriage at right angles to the line of motion thereof, a reproducer hinged to the lower ends of said swinging link, the length of the link and connections being such
20 that when the reproducer is at the end of the guide, the reproducer may be swung down over the end thereof into an approximately vertical position by swinging the link up into an approximately horizontal position.

25 4. The combination of the rotating sound-

record, the reproducer, the sliding carriage to which the reproducer is hinged, the rectilinear guide for said carriage extending horizontally and at right angles to the axis of the hinge, the
30 feed-screw for said carriage, the worm-gearing by which said feed-screw is driven from the record-rotating mechanism, the hinged half-nut carried by the carriage and meshing with the feed-screw, and a spring and cam which hold the half-nut in or out of engage-
35 ment with said feed-screw.

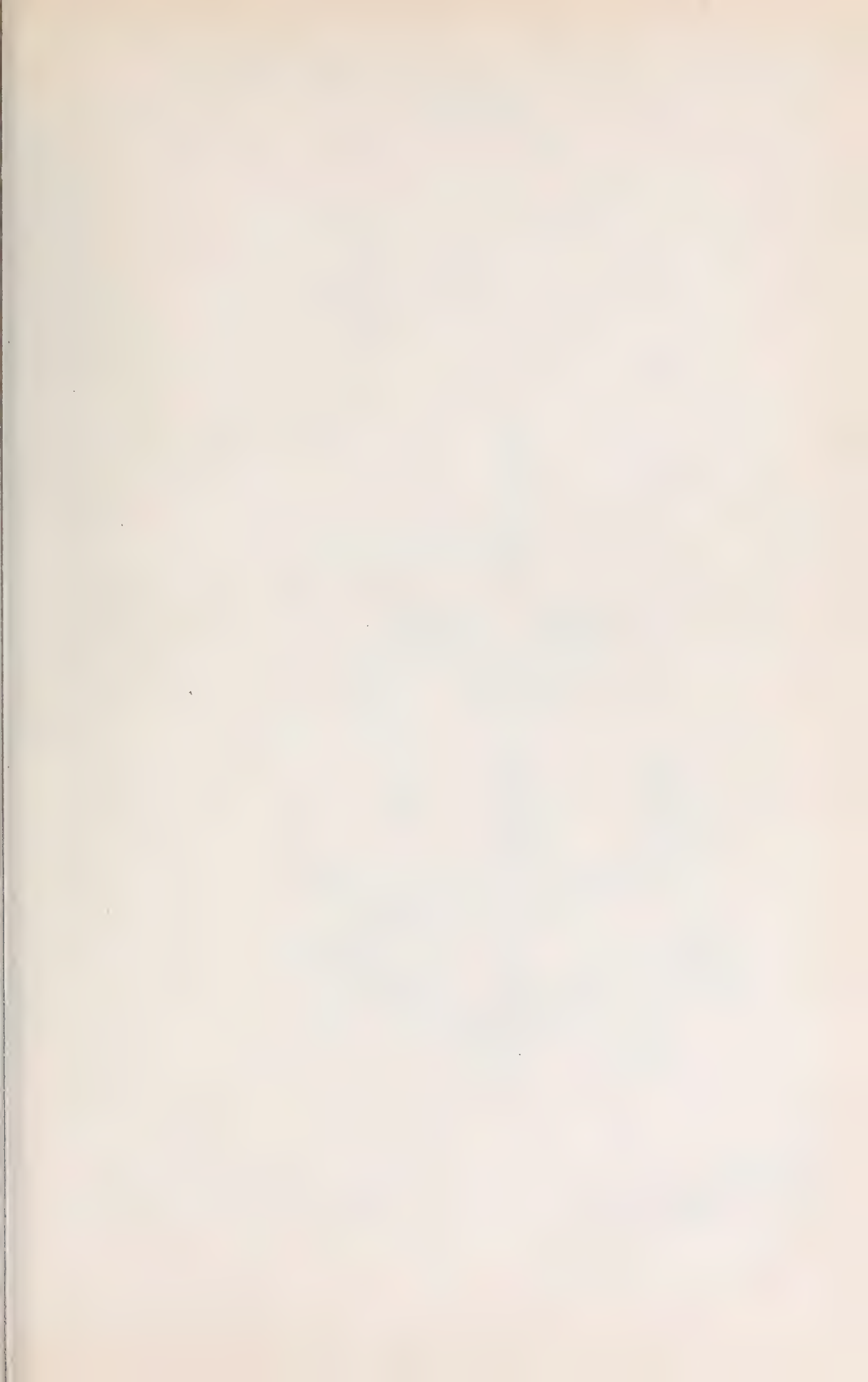
5. The combination of the rotating sound-record, the sliding carriage, the reproducer movable in a horizontal plane above the record and finding support adjacent to its ex-
40 tremities through its stylus engaging the record and a connection between its trumpet and the sliding carriage and a guide for the carriage.

Signed by me at New York this 13th day of 4;
December, 1899.

GEORGE K. CHENEY.

Witnesses:

A. PARKER-SMITH,
W. H. PUMPHREY.



No. 686,321.

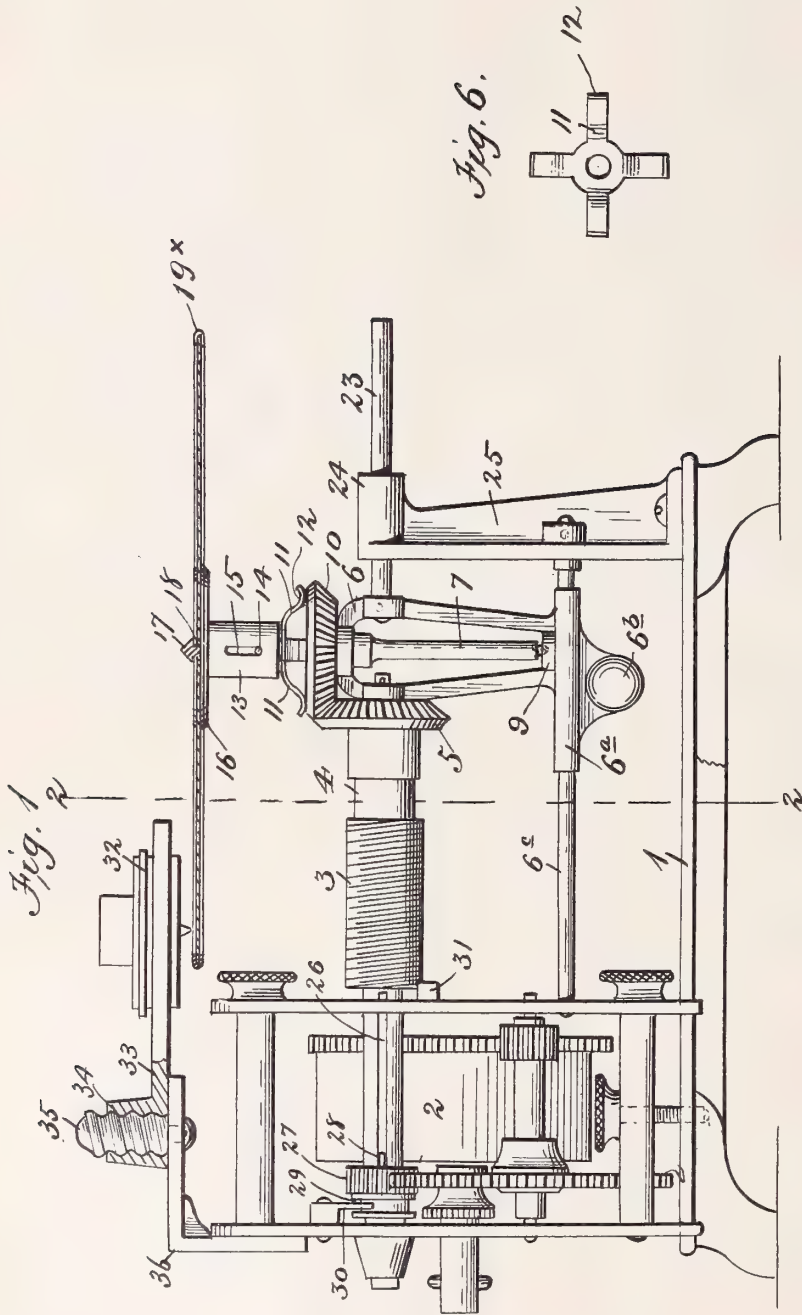
Patented Nov. 12, 1901.

**F. MYERS.
PHONOGRAPH.**

(Application filed Dec. 26, 1900.)

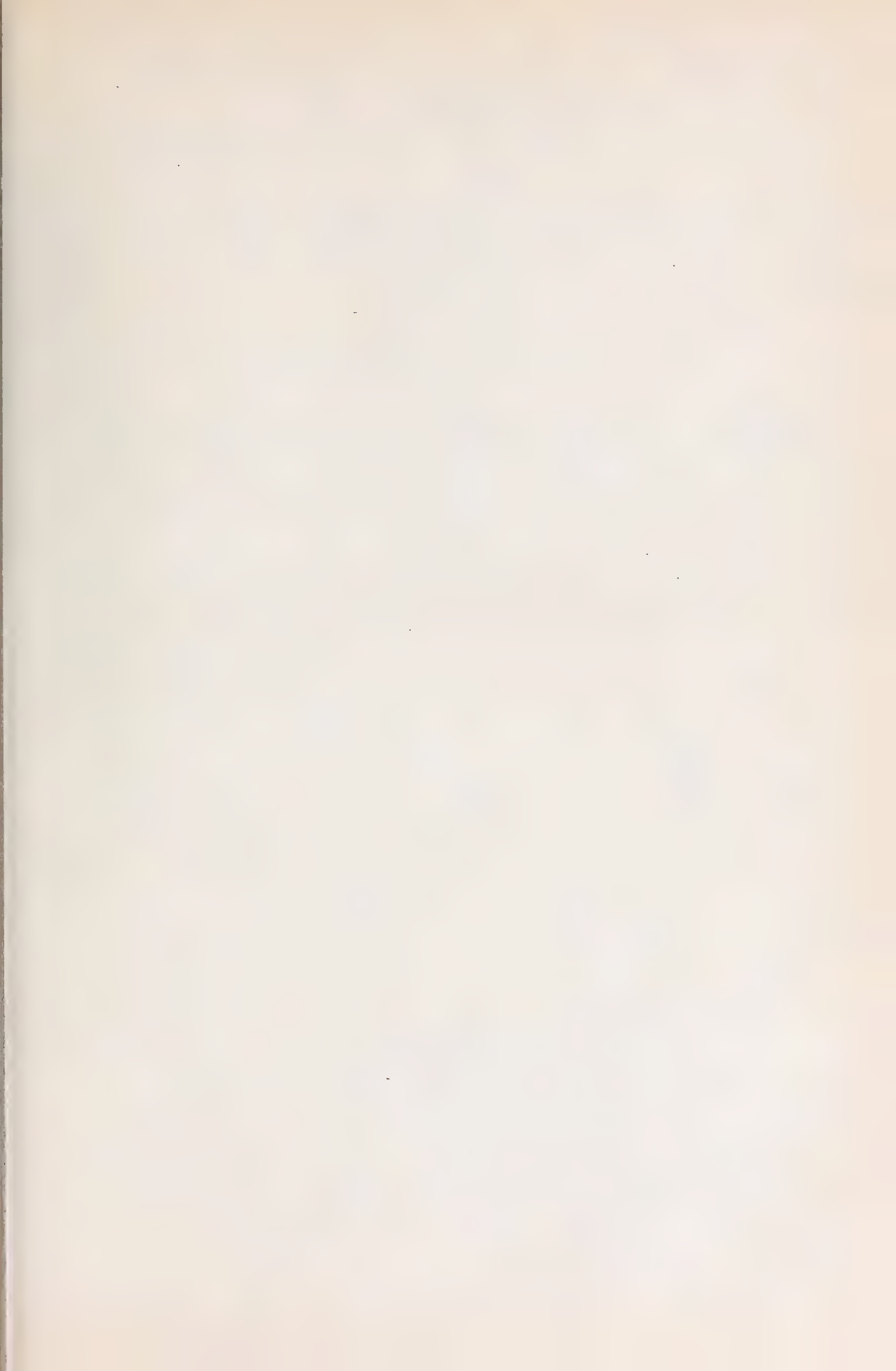
(No Model.)

2 Sheets—Sheet 1.



Witnesses
A. L. Curand.
Henry Henry The

Inventor
Frederick Myers
by E. P. Ramsey, his Attorney

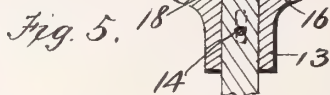
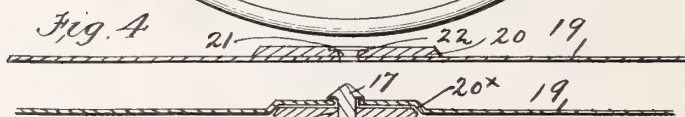
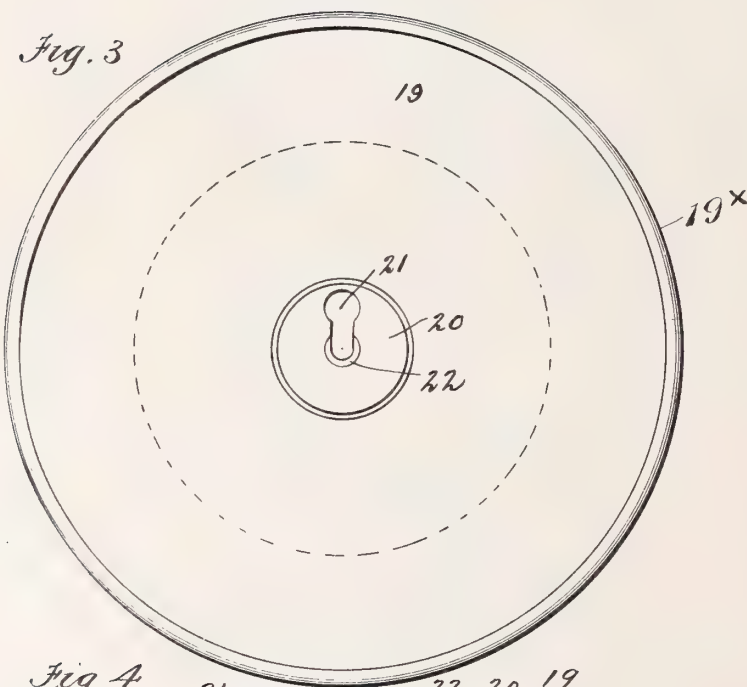
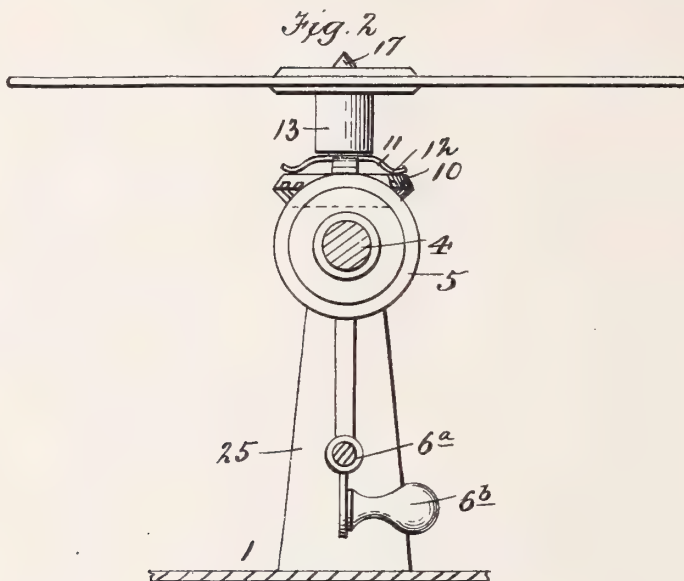


F. MYERS.
PHONOGRAPH.

(Application filed Dec. 26, 1900.)

(No Model.)

2 Sheets—Sheet 2.



Inventor

Witnesses

J. L. Curand
Henry H. H. H.

Frederick Myers
E. P. H. H. H. Attorney

UNITED STATES PATENT OFFICE.

FREDERICK MYERS, OF NEW YORK, N. Y., ASSIGNOR TO THE STYLOPHONE COMPANY, OF NEW YORK, N. Y., A CORPORATION OF WEST VIRGINIA.

PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 686,321, dated November 12, 1901.

Application filed December 26, 1900. Serial No. 41,045. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK MYERS, a citizen of the United States, residing at New York city, in the county of New York and State of New York, have invented certain new and useful Improvements in Phonographs, of which the following is a specification.

My present invention relates to sound-reproducing instruments; and the object of the same is to provide a record disk or tablet of thin resilient material which will possess the required elasticity to insure a constant contact with a superposed stylus mounted in a rigidly-supported sound-box. In a patent granted me December 4, 1900, No. 663,194, a record-disk having a thin elastic portion is described and claimed, and in that case the record is produced upon a thickened outer portion of the disk or tablet. I have ascertained by a series of experiments that a record-disk cut from sheet material like celluloid serves my purpose equally as well as a molded disk having a thickened portion to support the record, and there are many advantages arising from the use of the sheet-celluloid or similar material—viz., a material reduction in cost of production and the provision of an indestructible record, which occupies but a small space, as a number of such records may be arranged one upon another to occupy little space for packing and shipping. To give the required resiliency to such records, I may, however, apply a metal binding to their outer peripheries. I attain these objects by means of the construction illustrated in the accompanying drawings, in which—

Figure 1 is a front elevation of an instrument made in accordance with my invention, a part of instrument being shown in section. Fig. 2 is a vertical section on the line 2 2, Fig. 1. Fig. 3 is a plan view of a record-disk made in accordance with my present invention. Fig. 4 is a central vertical section of the same. Fig. 5 is a similar view of a modified form of record-disk mounted upon the central spindle. Fig. 6 is a plan view of the spring which holds the record in connection with the spindle.

Like numerals designate like parts wherever they occur in the different views of the drawings.

Referring to the drawings, the numeral 1

designates a table or stand upon which the instrument is mounted. A spring-motor 2 is suitably secured to the table, and this motor consists of a train of gearing designed to properly revolve the feed-screw 3. This feed-screw 3 may be formed upon a shaft 4, having a miter-gear 5 secured near one of its ends. The end of the shaft is reduced in size and journaled in a sliding carriage 6. A vertical spindle 7 is journaled in the carriage 6 and the lower end of the spindle 7 is reduced to a point and rests in a conical bearing 9, formed as a part of the sliding carriage. Secured to the spindle 7 is a miter-gear 10, which is always in mesh with the miter-gear 5 on the shaft 4. A spring 11, having any suitable number of arms 12, rests upon the gear 10, and seated upon this spring is a collar 13, mounted to slide upon the spindle 7. A stud 14 projects from the spindle into a slot 15, formed in the collar 13, and thus serves as a stop to limit the sliding movement of said collar. A support or face-plate 16 is formed upon the upper end of the collar 13, and the upper end of the spindle is provided with a head 17, having a reduced neck 18. The record-disk 19 consists of a thin piece of celluloid or similar material having a keyhole-slot formed centrally therein. As shown in Fig. 4, a central button or hub 20 is secured to the disk, and a keyhole-slot 21 is formed in the hub and in the disk. A recess 22 is formed in the hub or button at a point surrounding the smaller portion of the slot. When the record-disk is placed upon the spindle, the larger portion of the slot 21 passes over the head 17, and when the disk is moved until the head occupies the smaller portion of the slot 21 the head rests in the recess 22 and is held firmly therein by the stress of the spring 11. As shown in Fig. 5, the central hub or button 20 is dispensed with and the thin sheet material of which the disk is formed is pressed upward to form a recess 20^x, which fits the upper face and periphery of the support or face-plate 16 and holds the disk firmly in connection with the spindle 7. A metal binding or edging 19^x is applied to the periphery of the disk 19 to give strength and stability to said disk. By using this binding or edging I am enabled

to utilize a much thinner record, because the metal binding adds some stiffness to the disk.

Secured to the sliding carriage 6 in line with the feed-screw is a shaft 23, which slides in a sleeve 24, formed in a bracket 25, rising from the table or stand. The feed-screw shaft 4 passes through the motor-frame and is reduced in size and has a longitudinal groove 26, the end of said shaft being fitted to slide in the motor-frame. Loosely surrounding the shaft 4 is a pinion 27, having a key or spline 28, which fits to slide in the groove 26 in the shaft 4. Secured to the pinion 27 is a grooved hub 29, and a fork or yoke 30 spans the groove in the hub 29. The feed-nut 31 may be located under the feed-screw 3, and when in contact with the feed-screw the record-disk is revolved by the motor and fed laterally, the pinion 27 permitting the shaft 4 to slide through it and revolving therewith. Upon the lower portion of the carriage 6 a sleeve 6^a is formed, and a knob or handle 6^b extends outward from a depending portion of said sleeve 6^a. A shaft 6^c extends through the sleeve 6^a, said shaft being supported at one end in the motor-frame and at its other end in the bracket 25. When it is desired to move the record laterally by hand, the knob or handle 6^b is grasped and moved to the desired position when the nut has been thrown out of contact with the feed-screw.

The operation of the instrument will be understood from the foregoing. As the feed-shaft is revolved by the motor the shaft slides through the pinion 27 and the record is fed in a smooth and steady manner, owing to the sleeve 6^a and the shaft 6^c, which form a long and firm bearing for the sliding carriage. The sound-box 32 is held in place in a swinging arm 33 in any suitable manner, and the

arm 33 is provided with an interiorly-screw-threaded sleeve 34. A threaded stud 35 is secured in a vertical position to a bracket 36, attached to the motor-frame. The threads of the stud 35 and the sleeve 34 are of quick pitch, and when the arm 33 is moved to one side the sound-box is quickly raised until the stylus is out of the way of the record, and only one movement being necessary to move the sound-box and stylus away from the record. When the arm 33 is swung back into operative position, the sleeve 34 is firmly seated in place, as the threads of the stud will not permit further movement of the arm 33.

The thin record-disks occupy but little space, are indestructible, and by their resiliency are always in contact with the stylus during the operation of the instrument.

Without desiring to be limited to the exact construction shown and described, what I claim is—

1. A record for phonographs, consisting of a thin elastic disk of equal thickness throughout, said record adapted to be held in engagement with a stationary stylus by its inherent resiliency.

2. A record-tablet consisting of a thin sheet-celluloid disk of equal thickness throughout, and provided with a depressed central hub.

3. A record-disk of resilient material having an edging or binding applied to its periphery, said edging or binding being more rigid than the disk.

In testimony whereof I affix my signature in presence of two witnesses.

FREDERICK MYERS.

Witnesses:

HENRY H. SMYTHE,
GUY E. PADGETT.



No. 687,434.

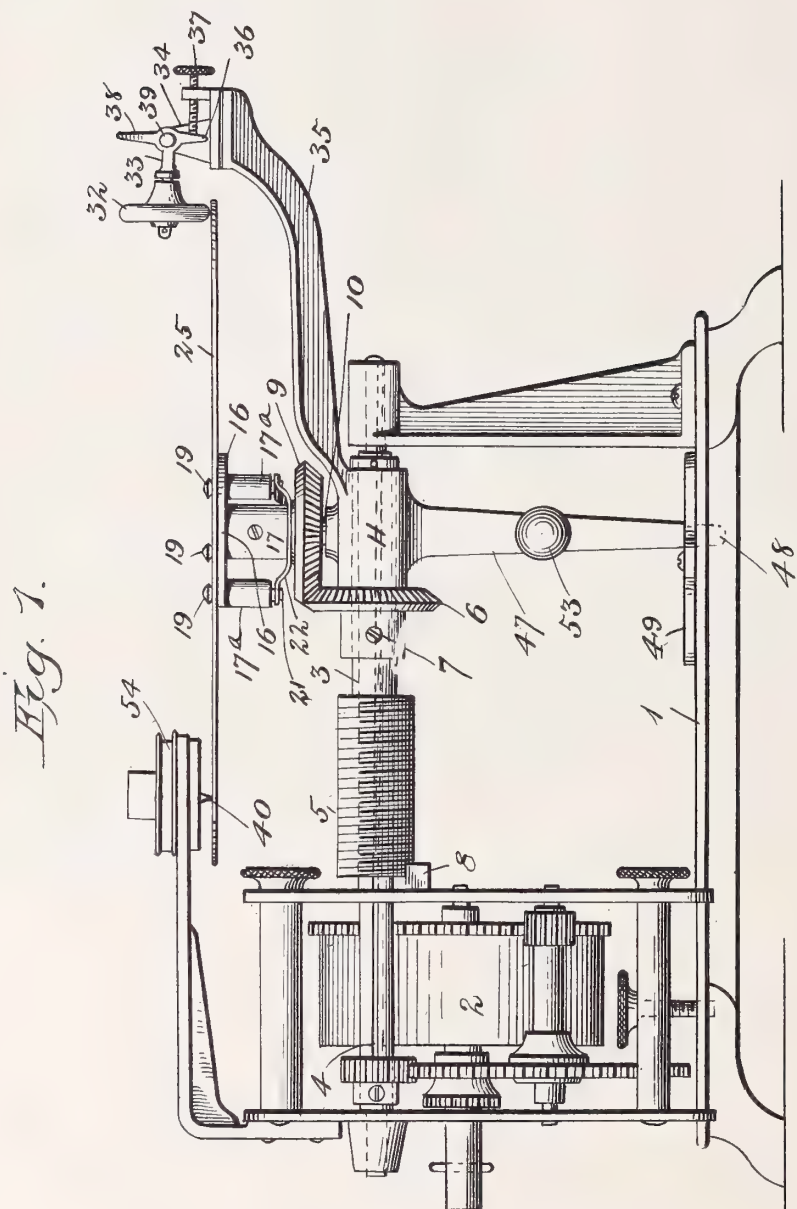
Patented Nov. 26, 1901.

F. MYERS.
STYLOPHONE.

(Application filed Jan. 25, 1901.)

(No Model.)

4 Sheets—Sheet 1.



Witnesses
F. L. Oursand
Geo. J. Weber.

Inventor
Frederick Myers
By E. P. R. Myers,
his Attorney

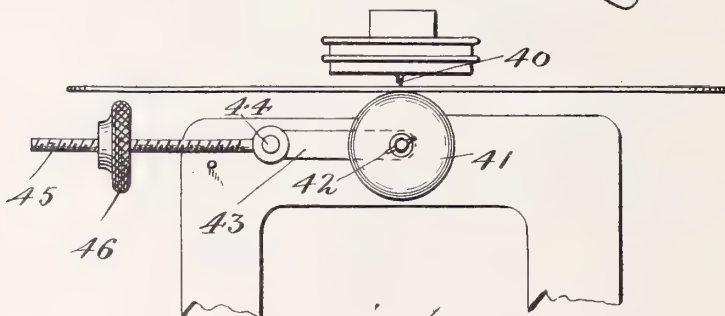
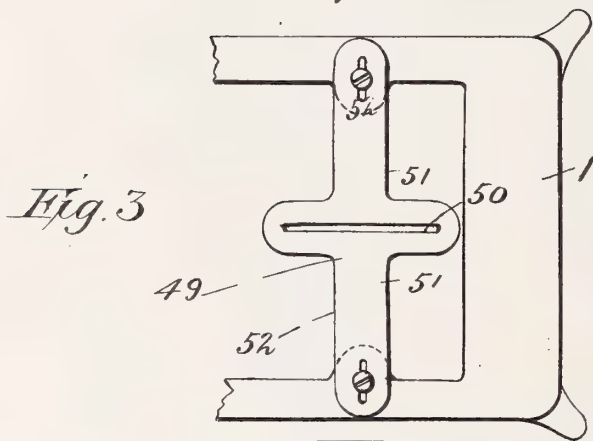
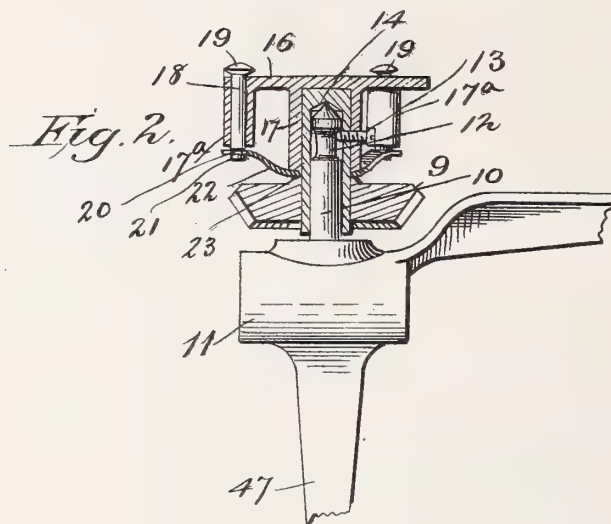


F. MYERS.
STYLOPHONE.

(Application filed Jan. 25, 1901.)

(No Model.)

4 Sheets—Sheet 2.



Witnesses
F. L. Curran
Geo. J. Weber

Inventor
Frederick Myers
by E. P. B. Myers
his Attorney



F. MYERS.
STYLOPHONE.

(Application filed Jan. 25, 1901.)

(No Model.)

4 Sheets—Sheet 3.

Fig. 5

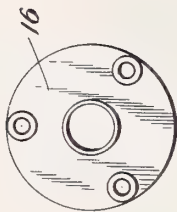


Fig. 6

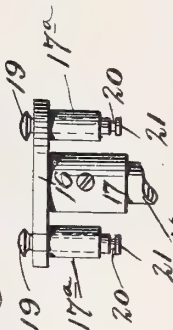


Fig. 7

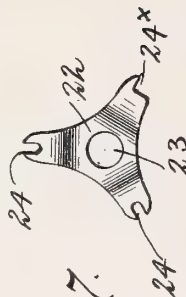
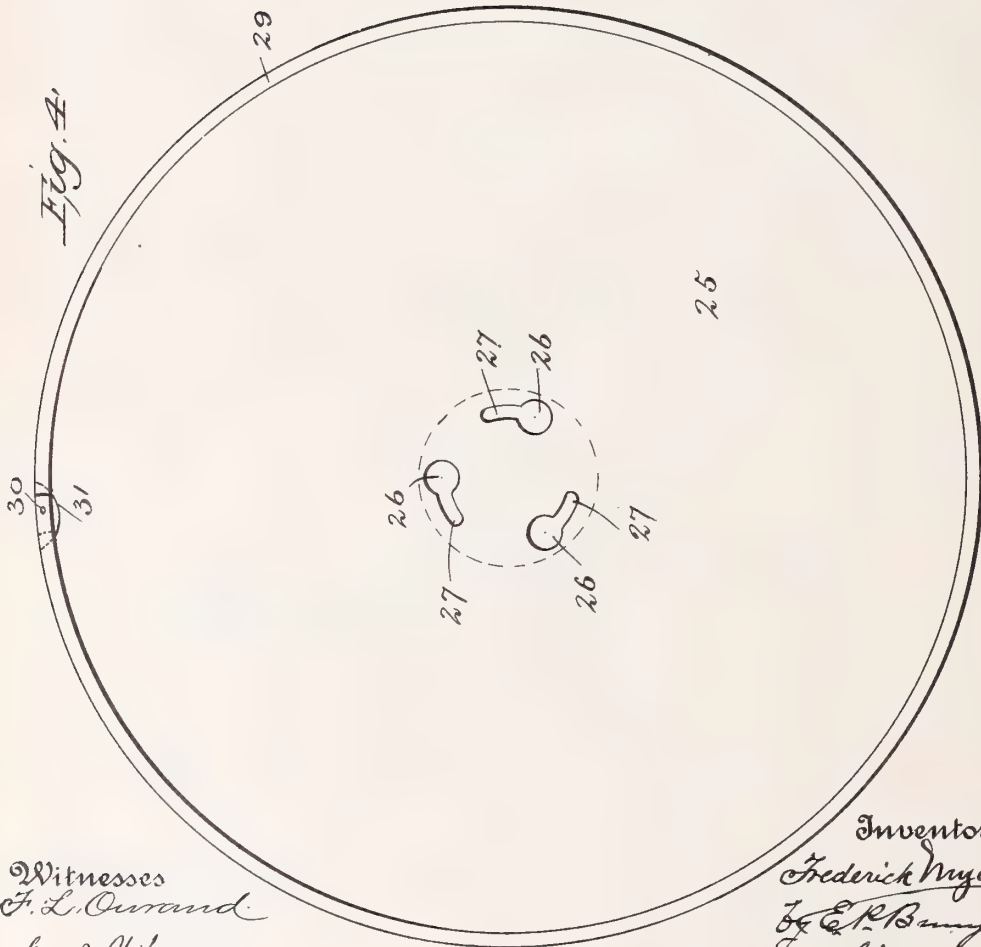


Fig. 4



Witnesses
F. L. Ourand.
Geo. J. Hibel.

Inventor
Frederick Myers
By E. R. B. *[Signature]*
his Attorney



F. MYERS.
STYLOPHONE.

(Application filed Jan. 25, 1901.)

(No Model.)

4 Sheets—Sheet 4.

Fig. 10.

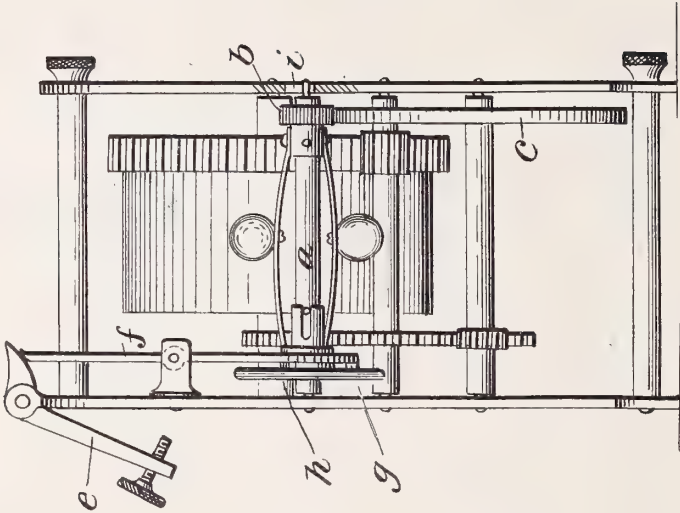
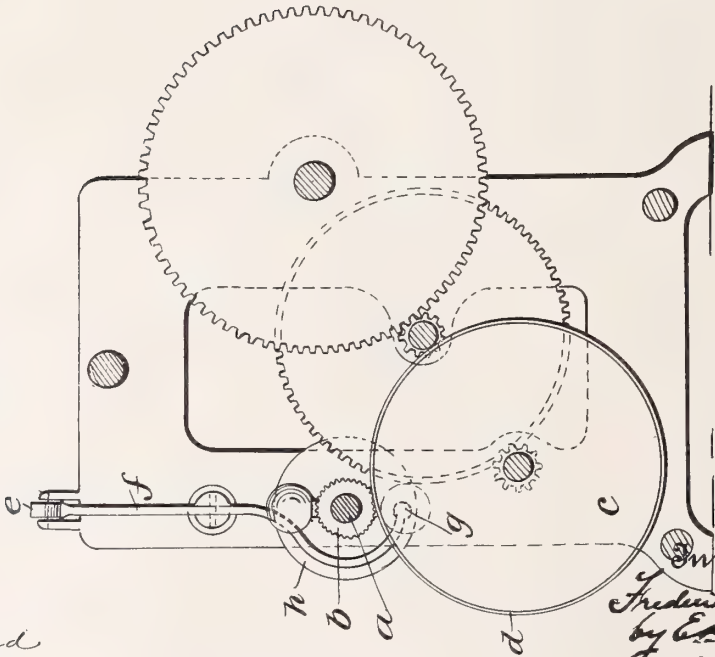


Fig. 9.



Witnesses
F. L. Ourand
J. B. Allen

Inventor
Frederick Myers
by E. A. Remington
his Attorney

UNITED STATES PATENT OFFICE.

FREDERICK MYERS, OF NEW YORK, N. Y.

STYLOPHONE.

SPECIFICATION forming part of Letters Patent No. 687,434, dated November 26, 1901.

Application filed January 25, 1901. Serial No. 44,708. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK MYERS, a citizen of the United States, residing at New York city, in the county of New York and State of New York, have invented certain new and useful Improvements in Stylophones; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My present invention relates to that class of sound-reproducing instruments known as "stylophones;" and the object of the invention is to provide simple and efficient means for giving the required vibratory movements to the record-disk to hold said record up to a stationary stylus. It has been proposed to mount the record-disks upon a yielding central support and to revolve the disk in contact with a stationary stylus. Another means for accomplishing a similar result is disclosed in Patent No. 663,194, granted me December 4, 1900; but in this patent the record-disk is made of a yielding or resilient material and a rigid central pin is used.

One of the objects of my present invention is to provide means whereby either a resilient or a non-resilient record-disk may be used and to provide a simplified construction for holding the record in constant contact with a stationary stylus.

Another object is to provide a simple and efficient means for holding the record centrally and firmly in place on the face-plate at the upper end of the revolving shaft.

Still another object is to furnish means for adjusting the record-disk to a horizontal position with relation to the sound-box or stylus and also to provide means for rendering the motor practically noiseless in operation.

Other objects and advantages will appear in the course of the specification.

In the accompanying drawings, which form a part of this specification, Figure 1 is a front elevation of a machine embodying my present invention. Fig. 2 is a detail and partial section of the record-shaft and means for holding the record in place and revolving it. Fig. 3 is a detail plan of a portion of the table or support for the instrument and showing the adjustable plate for adjusting the record to a position normal to the stylus. Fig. 4 is a

plan view of the record-disk. Fig. 5 is a bottom plan view of the face-plate or record-support. Fig. 6 is a detail elevation of the same. Fig. 7 is a plan view of the spring which serves to firmly hold the record in place. Fig. 8 is a detail elevation of a modified form of presser-roller for holding the record in contact with the stylus. Fig. 9 is a sectional elevation of the motor, illustrating certain means for rendering the operation of the motor substantially noiseless. Fig. 10 is a side elevation of the same.

Like characters of reference designate like parts wherever they occur in the different views of the drawings.

The numeral 1 designates the table upon which the instrument is properly mounted, and 2 is a spring-motor comprising a train of gearing designed to revolve the feed-screw shaft 3. The shaft 3 is provided with a longitudinal groove 4, and a feed-screw 5 is secured to said shaft 3 in any suitable manner. A miter-gear 6 is pinned to the shaft 3 by means of a set-screw 7, which passes through the hub of said miter-gear and extends into the groove 4 in the shaft 3. The nut 8 may be of the usual form and may be secured to a pivoted arm of the usual construction for throwing it into and out of engagement with the feed-screw 5. The miter-gear 9 is always in mesh with the miter 6 and is secured to a spindle 10, extending vertically from a sleeve 11, through which the shaft 3 extends. The spindle 10 has a conical upper end, and pivotally supported upon said end is a cap or shell 14, having a conical bearing near its upper end for the end of the spindle 10. The face-plate or record-support 16 is provided with a hollow sleeve 17, which fits over the cap or shell 14. A screw 13 extends through the sleeve 17, through the cap or shell 14, and into a recess 12, formed near the end of the spindle 10. The function of the screw 13 is to permit the ready removal of the record-support, together with the miter-gear 9 and the means for holding the record in place on said support or face-plate. Depending from the under face of the record-support 16 are a number of tubes or bearings 17^a, there being three such bearings or tubes shown; but any suitable number may be used. Mounted to slide loosely in these bearings or tubes are

the headed pins 18, the heads 19 projecting above the face-plate or record-support and the opposite or lower ends of said pins each having a reduced neck 20 and a flange or stop 21. A three-armed spring 22, having a central aperture 23 and arms provided with end slots 24, rests upon the top of the miter-gear 9 and is held in position by the sleeve 17, resting on top of said spring. This spring serves to hold the heads of the pins 18 down when the record-disk 25 has been placed in position over said heads, with the enlarged portions 26 of the slot 27 in said record passing over said heads and permitting the record to be turned until the heads 19 occupy a position over the smaller portions of said slots, and thus holding said record firmly against the support or face-plate 16. One of the arms of the spring 22 is provided with a hook or projection 24^x. This projection permits the spring to be placed in position without bending the spring. The outer rim of the record 25 is preferably provided with a metallic binding 29 to give sufficient stability to said record. The metal binding 29 may overlap the periphery on both sides of the disk and may be secured in place by a pin 30 at a point where the disk 25 is cut away, as at 31, in order that the record will not be enlarged at this point, or solder may be used in place of the pin 30.

The record-disk may be flexible or resilient, as is described in the patent referred to herein, or may be made practically rigid, and in either case will operate sufficiently well with the mechanism about to be described. A roller 32 is journaled upon an arm 33, pivoted to a bracket 34, rising from an arm 35, projecting outward from the sleeve 11. The arm 33 has a depending point 36 and a set-screw 37 bearing against the point 36 to regulate the weight to be exerted by the roller 32 upon the top of the record-disk 19. A vertical extension 38 serves as a stop to limit the throw of the roller 32 as it is swung upon its pivot 39 when changing a record upon the instrument. It will be understood that the roller 32 by its weight upon the top outer edge of the record-disk holds the opposite portion of the disk against the stylus 40 whether the disk is resilient or practically rigid. As a modification of this construction a roller 41, Fig. 8, may be located immediately under the stylus for throwing the disk upward to hold the record in contact with said stylus. The roller 41 is journaled upon a pin 42, extending from an arm 43, pivoted at 44. A threaded extension 45 is provided with a weighted nut 46, which may be adjusted in and out upon the screw 45 to give more or less tension or stress to the roller 41 as may be required in the production of different classes of records. Extending downward from the sleeve 11 is a finger 47, the lower end of which, 48, extends through a slot in the table 1 and through an adjustable plate 49, Fig. 3, said plate 49 having a slot 50, which coincides

with the slot in the table 1 and is adjustable laterally by set-screws 51, which extend through slots 52 in said plate. By means of this adjustment the finger 47 may be accurately adjusted to hold the record-disk in the desired horizontal relation to the stylus. A button or knob 53 serves to shift the record by hand when desired.

As shown in Figs. 9 and 10, the motor comprises a train of gearing and a governor similar to those shown in my patent hereinbefore referred to, with such differences as will now be described. The governor-shaft *a* is provided with a milled or knurled wheel *b*, and the wheel *c* is provided with a leather rim or tire *d*. The wheel *b*, running on the leather tire, is practically noiseless. This is a matter of great importance in an instrument of this character, as the least noise in the operation of the machine is transmitted with increased amplitude through the sound-box. The start and stop lever *e* is of the usual construction; but the brake-arm *f* is curved at its lower portion, as shown in Fig. 9, and the end of said arm is provided with a leather friction-shoe *g*, designed to bear upon the brake-disk *h* with more or less force, depending upon the position of the brake-arm *f*. The brake-disk is secured to the governor-shaft *a*, and the opposite end of said shaft is journaled in a slot *i* in the motor-frame. When the brake-shoe *g* is forced hard against the disk *h*, the milled wheel *b* is forced equally hard against the leather tire *d*, thus effectually stopping the motor.

The operation of the machine is as follows: When the motor 2 has been started and the feed-nut 8 is thrown in contact with the feed-screw 5, said feed-screw is gradually moved to the left in Fig. 1, carrying with it the miter-gears 6 and 9, the arm 35, the roller 32, and the record-disk 19, the sound-box 54 remaining in a stationary position and the stylus 40 being held in contact with the record-disk 19 by means of the roller 32 or the roller 41.

Having thus fully described my invention, what I claim is—

1. In a sound producing and reproducing instrument, a record in combination with a gravity-roller mounted to engage said record at or near its periphery, holding said record in contact with a stylus.

2. In a sound-reproducing instrument, a record-disk, means for revolving it and feeding it laterally in contact with a stylus, in combination with a gravity-roller bearing upon said disk at or near its periphery, and means for adjusting the pressure of said roller.

3. In a talking-machine a record provided with a series of slots in combination with a series of yielding pins projecting through the slots to hold the disk in operative position.

4. In a sound-producing instrument, a record-disk mounted upon a central support, a feed-screw shaft, a sleeve surrounding said shaft and carrying a depending finger sliding in a slotted plate movable for adjusting the

finger laterally to hold the record in a horizontal position, substantially as described.

5 5. In a sound-reproducing instrument, a central pin, a shell into which the pin projects, a face-plate having a tubular portion surrounding the shell, a series of headed pins passing through the face-plate, and a spring connected to the pins for depressing them, substantially as described.

10 6. In a sound-producing instrument, a roller mounted upon an arm pivoted under the record and engaging the record near its periphery, said roller being pivoted to an arm having a threaded extension and a weighted nut
15 for adjusting the pressure of the roller against the disk, substantially as described.

7. In a sound producing and reproducing

instrument, a feed-screw shaft, a sleeve surrounding the shaft carrying a finger, an adjustable plate for adjusting finger, to hold the 20 record-disk in a position normal to a stylus.

8. In a sound producing and reproducing instrument, a record-disk mounted on a central support, a feed-screw shaft carrying a finger, an adjustable plate for adjusting the 25 finger laterally, to hold the record-disk in a normal position, substantially as described.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

FREDERICK MYERS.

Witnesses:

GUY E. PADGETT,
GEO. W. POE.

No. 688,610.

Patented Dec. 10, 1901.

T. A. EDISON.
PHONOGRAPHIC RECORDING APPARATUS.

(Application filed Mar. 17, 1899.)

(No Model.)

Fig. 1

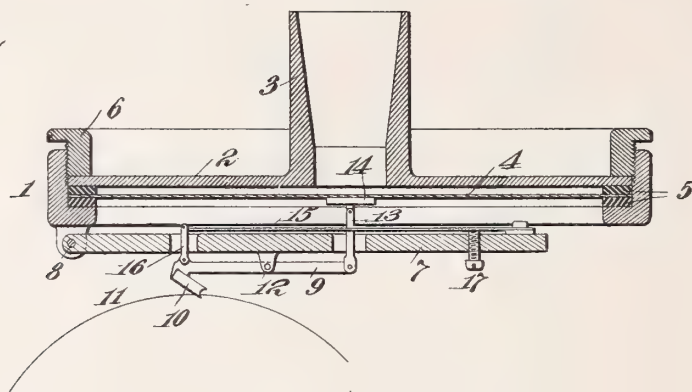


Fig. 2

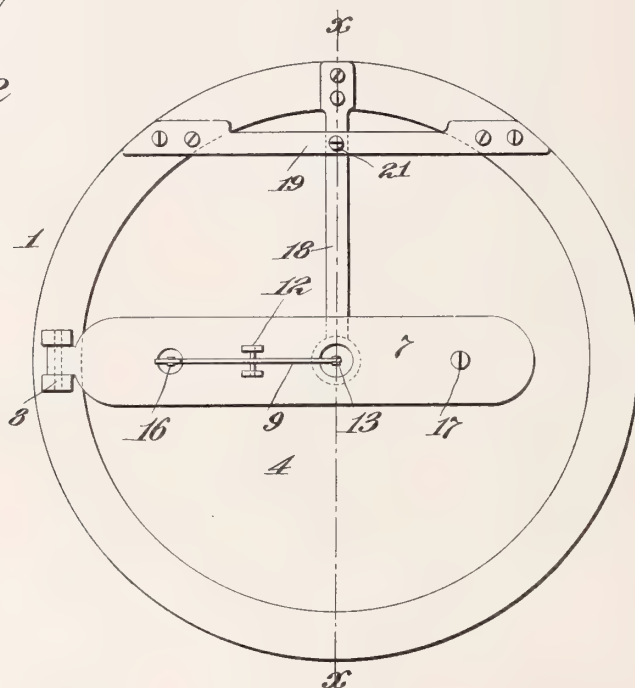
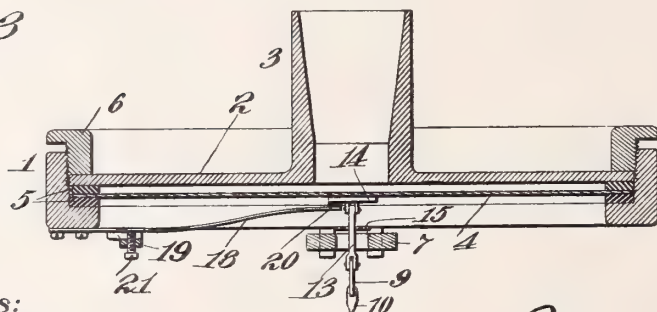


Fig. 3



Witnesses:

Geo. F. Colman
Geo. A. Taylor

Inventor

Thomas A. Edison
By Alfred Edmunds
Atty.

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

PHONOGRAPHIC RECORDING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 688,610, dated December 10, 1901.

Application filed March 17, 1899. Serial No. 709,448. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, a citizen of the United States, residing at Llewellyn Park, in the county of Essex and State of New Jersey, have invented a certain new and useful Improvement in Phonographic Recording Apparatus, (No. 1,003,) of which the following is a specification.

My invention relates to various improvements in apparatus for making phonographic records; and the object of the invention is to improve the sensitiveness and accuracy of the recording mechanism.

The invention consists in so arranging the diaphragm or other element influenced or vibrated by the sound-waves as to normally relieve it of all or substantially all stress, whereby it will be maintained in substantial equilibrium and will be more sensitively receptive and more accurately responsive to sound-vibrations.

In phonographic recorders as heretofore constructed the diaphragms or equivalent devices have either been placed under a strain by the compensating weight employed to cause the cutting or engraving tool to properly track upon the recording-surface and at the same time to accommodate any eccentricities or variations in the blank or in cases where no weight is employed for this purpose the pressure necessary to properly engage the cutting or engraving tool with the recording material to the requisite depth to record the movements of the diaphragm under the sound-vibrations of itself places the diaphragm under stress. These strains destroy to a great extent the sensitiveness of the diaphragm or other vibrating element, especially to the weak overtones of musical instruments, and prevent the accurate recording thereof.

In order to overcome the objection indicated, the invention consists in employing a counteracting-spring coöperating with the diaphragm and which counteracts the normal strains to which the diaphragm may be subjected, either due to the employment of the usual compensating weight or to the direct engagement of the recording device with the record, as with some types of phonograph-recorders.

In the accompanying drawings, Figure 1 is

a sectional view through a phonograph-recorder of the type employing a compensating weight, illustrating my present improvements applied thereto, including the employment of a secondary or auxiliary spring; Fig. 2, a bottom view of the same; Fig. 3, a section on the line X X of Fig. 2.

In all of the above views corresponding parts are represented by the same numerals of reference.

1 is the usual cylindrical casing, having a top 2, provided with a nipple 3, to which the speaking-tube is secured.

4 is the diaphragm, held in place between the rubber buffers 5 5, and 6 the clamping-ring for forcing the top 2 upon the upper buffer.

7 represents the compensating weight, pivoted at 8, and 9 the recording-lever, carrying the cutting or engraving tool 10 at one end, which engages with the recording-surface 11, generally in the form of a cylinder. The lever 9 is pivoted at 12 to the compensating weight 7 and connects at its free end by a link 13 with a small disk 14, secured to the center of the diaphragm 4 in any suitable way, as by means of shellac. Preferably I employ an auxiliary spring 15, connected to one end of the weight 7, as shown, and at the other end by a link 16 to the working end of the lever 9. This spring tends to depress the cutting or engraving tool 10 with an additional tension into engagement with the recording-surface and prevents successive vibrations of the cutting or engraving tool from the effects of momentum or the actual "jumping" thereof when subjected to the effect of unusually powerful vibrations. An adjusting-screw 17 is employed for adjusting the tension of the spring 15 when used.

Heretofore the tendency of the compensating weight 7 has been to exert a downward stress upon the diaphragm 4, and by reason of this stress the diaphragm is not affected sensitively by the vibrations, nor does it respond accurately thereto. I therefore provide for the elimination of any stress upon the diaphragm, whereby it will be maintained in substantial equilibrium, for the reasons which I have explained. With a device of this character either a counteracting spring or weight may be employed, the former being prefer-

able with the specific form of recorder shown. This counteracting-spring 18 is secured to the bottom of the casing 1, passes above a bridge 19, and at its free end bears beneath the disk 14, a section of rubber 20 or other elastic material being interposed between the spring and said disk to prevent any rubbing sounds from being recorded. An adjusting-screw 21 engages through the bridge 19 and bears against the counteracting-spring 18, whereby the exact stress or strain which is exerted upon the diaphragm 4 by the compensating weight 7 and the auxiliary spring 15, if used, may be removed from the diaphragm and taken up by the spring 18. In this way the diaphragm will be maintained in absolute equilibrium, normally as much so, in fact, as if there were no connection whatever between it and the recording mechanism. Therefore it is in a condition to respond sensitively to vibrations of every character and to accurately record them. At the same time the connecting mechanism between the diaphragm and the cutting or engraving tool will be under stress, whereby the cutting or engraving tool will respond to all vibrations, however abrupt, without lost motion or false motions due to momentum.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is as follows:

1. In a phonographic recording device, the combination with a diaphragm, of a recording device connected therewith, a counteracting-spring for counteracting the stress imposed upon the diaphragm by the engagement of the recording device with the recording-surface, and an elastic cushion between the counteracting-spring and the diaphragm, substantially as set forth.

2. In a phonographic recording device, the combination with a diaphragm, of a compensating weight, a recorder connected with the diaphragm and said compensating weight, and means for counteracting the stress imposed upon the diaphragm by the compensating weight, substantially as set forth.

3. In a phonographic recording device, the combination with a diaphragm, of a compensating weight, a recorder connected with the diaphragm and said compensating weight, and a spring connected with the diaphragm for counteracting the stress imposed upon the diaphragm by the compensating weight, substantially as set forth.

4. In a phonographic recording device, the combination with a diaphragm, of a compensating weight, a recorder connected with the diaphragm and said compensating weight, and an adjustable spring connected with the diaphragm for counteracting the stress imposed upon the diaphragm by the compensating weight, substantially as set forth.

5. In a phonographic recording device, the combination with a diaphragm, a compensating weight and recording devices interposed between the diaphragm and said weight, of an auxiliary spring carried by said weight and connected with the recording devices, substantially as set forth.

6. In a phonographic recording device, the combination with a diaphragm, a compensating weight and recording devices interposed between the diaphragm and said weight, of an auxiliary spring carried by said weight and connected with the recording devices, and means for adjusting the tension of said auxiliary spring, substantially as set forth.

7. In a phonographic recording device, the combination with a diaphragm, of a compensating weight, a recording-lever pivoted to said weight and carrying at one end a cutting or engraving tool, a link connecting the other end of said lever with the diaphragm, and an adjustable spring carried by the compensating weight and connected at its free end to the working end of the recording-lever, substantially as set forth.

This specification signed and witnessed this 10th day of February, 1899.

THOMAS A. EDISON.

Witnesses:

ALEXANDER ELLIOTT, Jr.,
JOHN F. RANDOLPH.

26
(688) 39

2
12

No. 688,739.

Patented Dec. 10, 1901.

J. W. JONES.
PRODUCTION OF SOUND RECORDS.

(Application filed Nov. 10, 1897.)

(No Model.)

FIG. 1.

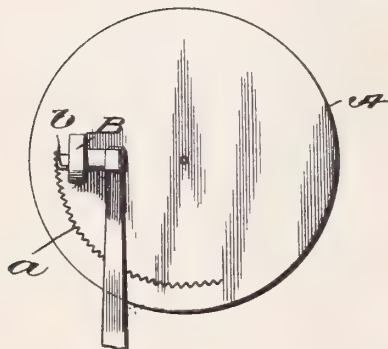


FIG. 2.

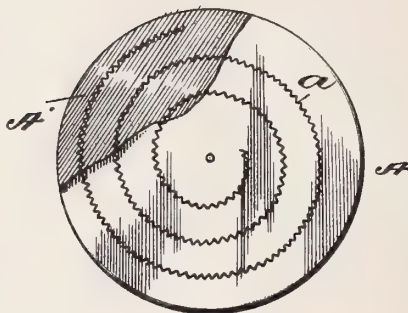


FIG. 3.

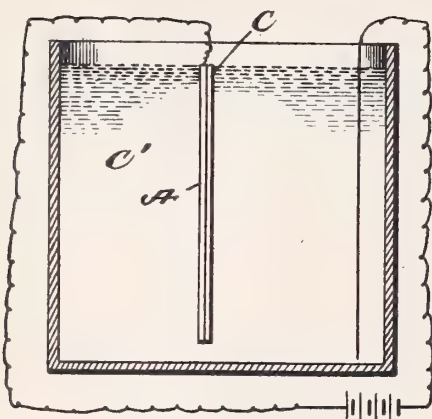
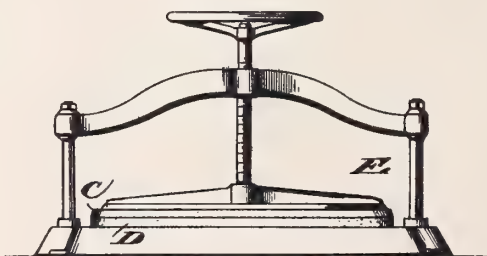


FIG. 4.



Witnesses

Wm. H. Jones
Geo. L. Jones

Inventor

Joseph W. Jones

By *Thos. W. Jones*
his Attorney

UNITED STATES PATENT OFFICE.

JOSEPH W. JONES, OF NEW YORK, N. Y., ASSIGNOR TO HIMSELF, AND
JOSEPH A. VINCENT, OF PHILADELPHIA, PENNSYLVANIA.

PRODUCTION OF SOUND-RECORDS.

SPECIFICATION forming part of Letters Patent No. 688,739, dated December 10, 1901.

Application filed November 19, 1897. Serial No. 659,170. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH W. JONES, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented a certain new and useful Improved Production of Sound-Records; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to the commercial production of sound-records, and has for its object the production of a number of copies of an original record characterized by lateral undulations of substantially uniform depth. Heretofore records of this character, generally known as "gramophone-records," have been produced by first tracing the lateral undulations or zigzags in a fatty (inky) film that protects an etching-surface, then etching this tracing into the material to form a groove, then running a blunt stylus through this groove to smooth the ragged etched surface, and finally electroplating this touched-up surface and pressing the matrix so formed into a suitable material to form the commercial record. The etching process, for reasons unnecessary to state, causes considerable departure or deviations, so that the etched groove is far from being a correct representation of the path of the recording-stylus. The deformations from this cause are still further exaggerated by the use of the smoothing-stylus. I avoid these objections by producing in the first instance a fully-finished original record whose grooves are of the final depth required, slight but appreciable, thus doing away with the necessity for etching and the subsequent smoothing made necessary thereby. The original records made by this process are electroplated and the electroplate matrix used as a die in the ordinary manner.

In carrying out my invention I employ a disk or tablet, of suitable recording material, (as wax or a wax-like composition, preferably rendered sufficiently hard, as by an admixture of rosin, to withstand the treatment employed in giving it an electrical conducting-surface.) Upon the surface of this tablet I then form by the use of a sound-recording

machine in a well-known manner a spiral groove of practically uniform depth that contains lateral sinuosities or irregularities corresponding to or representing the sound-waves recorded. This cutting or engraving of a record-groove by the lateral movement of the stylus differs from the operation of the well-known graphophone system in that the resistance offered the stylus of a graphophone in cutting downward to produce the vertical irregularities characteristic of that system varies practically as the cube of the length of the vibrations of the diaphragm and stylus, whereas in producing my original records the resistance encountered by my recording-stylus is exactly equal to the length of the vibrations. On account of this difference in principle I am enabled to obtain more accurate, and therefore better, records of the original sounds. The original record so formed is an exact copy of the record to be used for reproducing. It is a complete and finished record, its grooves being of a slight yet appreciable depth, and no deepening or retouching by an etching fluid or in any other manner is required. This original record is then prepared for receiving the electroplate deposit by coating its surface with an electric conducting medium—such, for instance, as carbon, (graphite,) as commonly employed in the process of electroplating, or, as a substitute, nitrate of silver. This coated plate is then placed in an electroplating-bath, and a layer of metal (nickel, steel, &c.) is deposited upon it. The thin shell or matrix thus formed is then separated from the original record, which may be used repeatedly in the same manner to form other matrices. Owing to the flat shape of the original and of the matrix and to the fact that the sound-groove of the former and the corresponding ridge of the latter do not lock the two are separated readily without the employment of heat or of shrinkage, it being obvious that the repeated heating and resultant cooling are very injurious to the accuracy of the record. The matrix itself may be backed up with a supporting-plate, such as brass or bronze cast upon (or sweated to) the reverse of the matrix. This complete matrix constitutes a stamp or die, the record appearing on its face in the form of a raised ridge

having lateral sinuosities or irregularities that correspond to the sound-waves being the exact counterpart of the original sound-groove. This die is then pressed or stamped into a disk or tablet of suitable composition, such as electrose or other fibrous material that can be readily handled in a soft state and that will receive truly and retain faithfully an accurate impression of the record on the face of the die. The stamped record thus produced is the finished commercial article ready for use, being a faithful and indestructible copy of the original path traced by the recording-stylus.

In the drawings annexed hereto to illustrate this invention, Figure 1 shows a recorder in the act of producing the original record. Fig. 2 shows the original record partially covered with graphite. Fig. 3 shows diagrammatically the electroplating apparatus for forming the metallic matrix on the original record, and Fig. 4 shows a press for forming stamped records from the matrix.

A is a tablet of wax-like composition; B, a recording device whose stylus *b* cuts or engraves into the surface of tablet A a line or groove or channel *a* of uniform depth and undulating laterally. The shaded portion A', Fig. 2, represents the graphite coating applied over surface of A. Tablet A having its electroconductive coating A' is immersed in a plating-bath C', Fig. 3, by which a (copper) matrix or reverse C is formed. Matrix C is laid on a tablet D of suitable material in a press E and the finished product produced.

I am aware that it has been proposed to make duplicates of sound-records of the vertically-undulated character, the type generally known as "graphophone-records," by first coating the surface of such sound-record with a conducting material, next depositing an electroplate thereon to form a die, and then pressing this die into some suitable material. This process is impracticable and unsuccessful for two reasons. First, when the conducting material (as plumbago) is deposited upon the vertical irregularities that are the very essence of this kind of record it forms a covering that resembles on a minute scale a light fall of snow over a landscape. The sharp contours of the vertical irregularities are rounded, (the more delicate and minute irregularities being filled in and completely obliterated,) with a resulting mutilation of the record. Again, when the electroplate die is pressed into the surface to be stamped any inequality in the material being stamped would cause unequal impressions to be made, some deeper than others, which is fatal to the accuracy of a record, whose very existence lies in the comparative depths and heights (vertical) of its irregu-

larities. Furthermore, the presence (between the die and the material being stamped) of minute particles of dust or other foreign matter, or even of particles of air, (air-bubbles,) would to that extent still further distort and disfigure the impressions stamped by an already inaccurate die, whereas in the laterally-undulated records any vertical deformation (whether due to the causes just pointed out or to any other cause) does not in the slightest degree affect the accuracy of the record, the essence of which lies in its lateral undulations, for the deposit of a film of conducting material does not modify the lateral outline, but only the vertical irregularities, and the deformations caused by the presence of foreign particles in the stamping or pressing process are vertical, and consequently do not affect a record that depends upon its lateral and not its vertical outline.

For the foregoing reasons I do not claim my new process in connection with sound-records characterized by vertical irregularities, but limit it to records characterized by lateral undulations of practically uniform depth.

I claim—

1. The herein-described method of producing sound-records, which consists in cutting or engraving upon a tablet of suitable material, by means of the lateral vibrations of a suitable stylus, a record-groove of appreciable and practically uniform depth and having lateral undulations corresponding to the sound-waves, next coating the same with a conducting material, then forming a matrix thereon by electrolysis, and finally separating this matrix and pressing the same into a tablet of suitable material, substantially as described.

2. The process of producing commercial sound-records of the type indicated, which consists of first preparing a flat tablet or disk of soft wax-like material, then engraving thereon by means of the lateral vibrations of a suitable stylus a record-groove of appreciable and uniform depth and having lateral undulations corresponding to sound-waves, next rendering the surface thereof electrically conductive, then forming a matrix thereon by electrolysis, next separating the matrix from the original record-disk without the use of heat, and finally impressing said matrix into a disk of suitable material to form the ultimate record, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

JOSEPH W. JONES.

Witnesses:

HARRY A. DINMORE,
WALTER C. PUSEY.

G. BETTINI.

APPARATUS FOR DUPLICATING OR MULTIPLYING SOUND RECORDS.

(Application filed Apr. 3, 1897.)

(No Model.)

2 Sheets—Sheet 1.

Fig. 1,

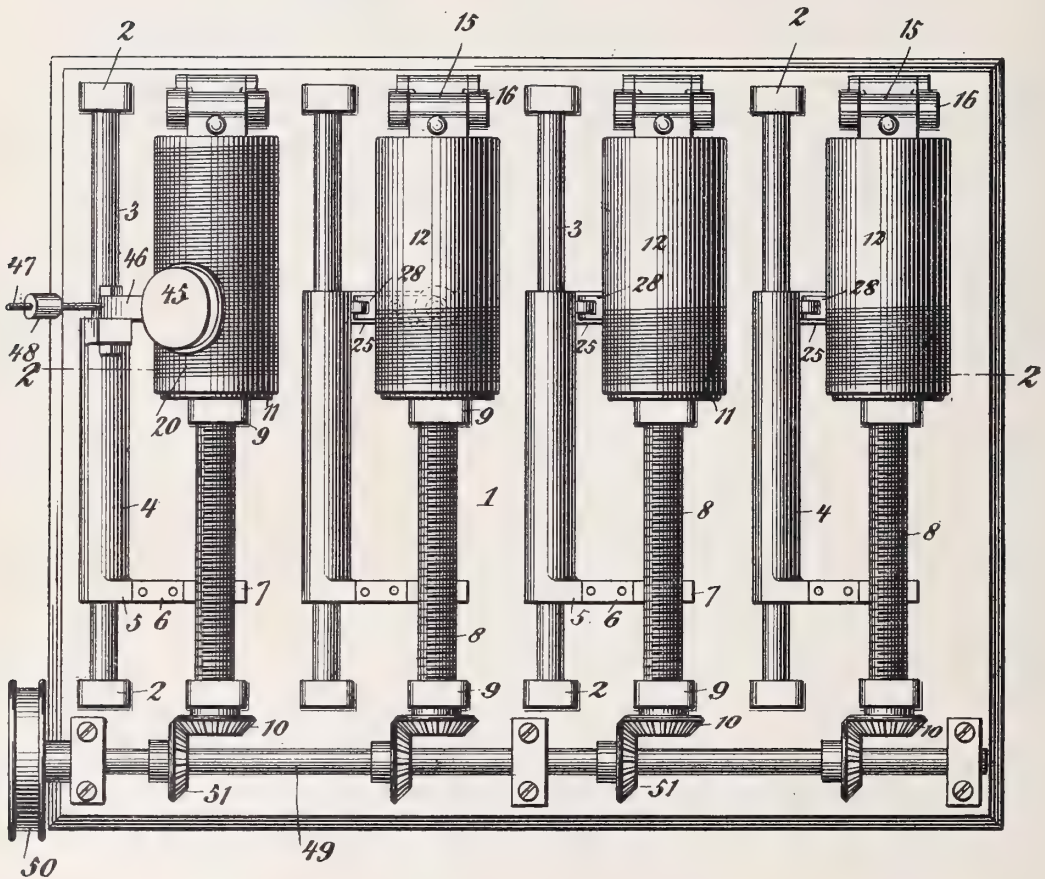
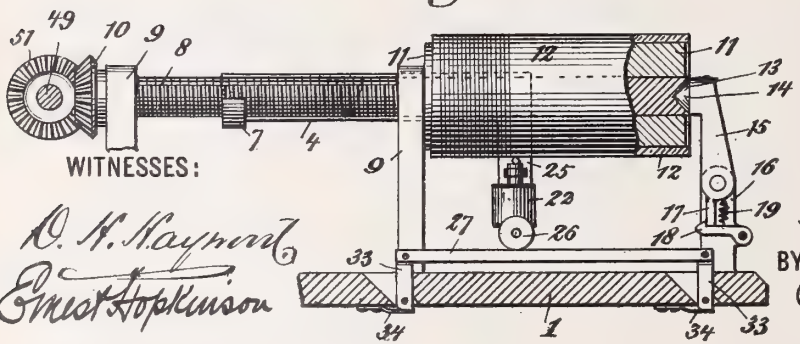


Fig. 3,



WITNESSES:

O. H. Raymond
Ernest Hopkinson

INVENTOR

Gianni Bettini

BY

E. N. Dickerson
His ATTORNEY



G. BETTINI.

APPARATUS FOR DUPLICATING OR MULTIPLYING SOUND RECORDS.

(Application filed Apr. 3, 1897.)

(No Model.)

2 Sheets—Sheet 2.

Fig. 2.

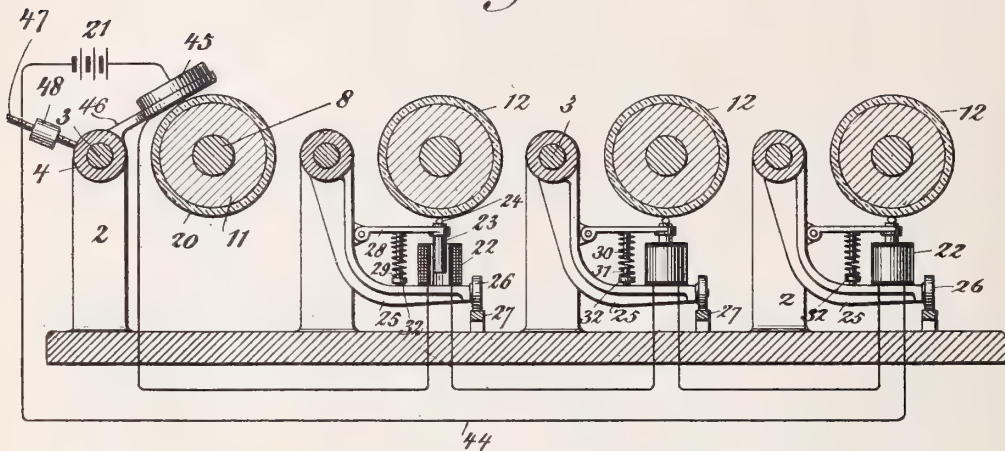


Fig. 4.

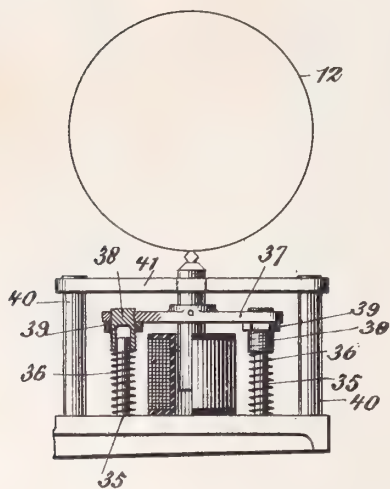
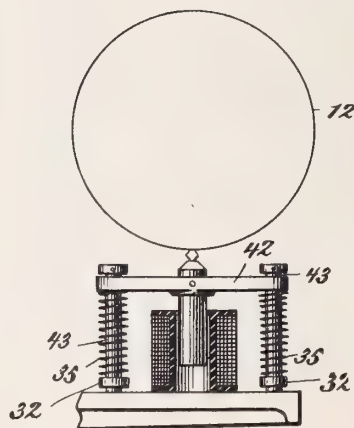


Fig. 5.



WITNESSES:

O. H. Hayward
Ernest Hopkinson

INVENTOR

Gianni Bettini

BY *E. N. Dickerson*
 his ATTORNEY

UNITED STATES PATENT OFFICE.

GIANNI BETTINI, OF NEW YORK, N. Y., ASSIGNOR TO HIMSELF AND
EDWARD N. DICKERSON, OF NEW YORK, N. Y.

APPARATUS FOR DUPLICATING OR MULTIPLYING SOUND-RECORDS.

SPECIFICATION forming part of Letters Patent No. 688,921, dated December 17, 1901.

Application filed April 3, 1897. Serial No. 630,542. (No model.)

To all whom it may concern:

Be it known that I, GIANNI BETTINI, of the city, county, and State of New York, have invented a new and useful Improvement in Apparatus for Duplicating or Multiplying Sound-Records, of which the following is a specification.

My invention relates to an apparatus for reproducing the record of a master-cylinder on a single or a plurality of phonogram-blanks.

In the drawings I have illustrated an apparatus designed to carry out my invention, in which—

Figure 1 is a plan view. Fig. 2 is a section along line 2 2 of Fig. 1. Fig. 3 is a detail side elevation view of one of the cylinders and supporting parts, partly in section. Fig. 4 is a detail elevation view, partly in section, of a modification of the means for making the record; and Fig. 5 is a view similar to Fig. 4, but showing another modification.

Like numerals of reference refer to like parts throughout the several views of the drawings.

Referring to the drawings in detail, 1 represents the base of the instrument. In standards 2 are journaled a series of shafts 3, carrying sleeves 4, on one end of each of which is an arm 5, having a spring connection 6, with a half-round threaded socket 7 engaging a correspondingly-threaded shaft 8. The shafts 8 are suitably journaled, as in standards 9, and are provided at one end with beveled gears 10 and at the other end support a mandrel 11, on which is mounted a cylinder 12, of suitable material, adapted to receive a sound-record. The shafts 8 at the end opposite to the one provided with the beveled gear have a recess 13, in which engages a correspondingly-shaped bearing-point 14 on the end of an arm 15, journaled in standards 16 on the base 1. The arms 15 are each provided below their journaled points with a pin 17, engaging a catch 18, which is kept in engagement therewith by a spring 19 when in its normal position. These arms 15, it will be seen, constitute a removable journal for one end of a shaft 8 to permit of placing and withdrawing the cylinders in and out of operative position.

One of the series of cylinders shown, and

which I will designate with the numeral 20, is a master-cylinder—that is, it is a cylinder which is provided with the sound-record which it is desired to copy. To duplicate or multiply the sound-record upon this cylinder, I suitably mount upon the sleeve 4, which is appurtenant to the shaft 8, carrying the master-cylinder 20, any desired form of electrical transmitter of sound-waves, as an ordinary microphone-transmitter 45, carried on an arm 46, one end of which is pivotally secured to the sleeve 4, the microphone being counterbalanced by means of an adjustable counterbalance consisting of a threaded rod 47, upon which screws a weight 48. The vibrating diaphragm of the microphone-transmitter is provided with a stylus designed to follow the sound-record line of said master-cylinder. This transmitter is in circuit with a source of electricity, which is here represented in conventional manner as a battery 21, and fluctuations in the current caused by the vibrations of the diaphragm of the transmitter are utilized to effect corresponding movements in the parts carrying the stylus in contact with each of the cylinders upon which the record of the master-cylinder is to be duplicated. In the form of apparatus here illustrating the invention I have shown these parts as consisting of a solenoid 22, upon whose core 23 is carried the cutting-point or stylus 24.

Depending from each of the sleeves 4 (excepting, of course, the one appurtenant to the master-cylinder) is an arm 25, whose end is provided with a roller 26, running on a track 27. These arms 25 support the solenoids 22. Each arm is provided with a pivoted arm 28, upon whose outer end is secured the core 23, carrying the stylus mounted on the arm 28 and being held to contact with the record-surface by means of a spring 29, held in position by a stem 30, secured to said arm 28, and a stem 31 upon the arm 25, adjustment of this spring being effected by any desired means, as by collar and screw 32.

For the purpose of withdrawing the solenoid and its core carrying the stylus out of position, so as to permit of the removal or placing of a cylinder into position, I have shown the track 27 as carried on pivoted arms 33,

which are maintained either in or out of normal position by springs 34, bearing upon different surfaces of said arms 33.

In Fig. 4 I have shown a modification in which the arm 25 is provided with stems 35, upon which are mounted adjustable springs 36, secured to the core of the solenoid is a transverse arm 37, upon each of whose ends is a recessed screw 38, adapted to receive the end of the stem 35, said screw being for the purpose of adjusting the tension of the springs 36, secured to the desired adjustment by nuts 39. 40 represents two posts whose upper ends are connected by an arm 41, provided with an opening at its center portion, through which projects the upper end of the core, whereby the said core is guided to prevent lateral vibration.

In Fig. 5 I have shown another modification in which the core of the solenoid has secured to it an arm 42, each end of said arm being provided with an opening through which passes a post 43, said post being provided with springs 35^a, as in the construction shown in Fig. 4, which springs are adjustable by means of a collar and screw 32. 44 represents the line-wire of the circuit, in which are connected in series the several solenoids of the system.

The operation of the device will now be apparent. Assuming that all the cylinders are in position, the stylus of the transmitter is placed in the groove constituting the sound-record of the master-cylinder and the instrument set in operation by driving the shaft 49, as by pulley 50, from any suitable source of energy, whereby the shafts 8 are rotated by the engagement of the beveled gears 10 with beveled gears 51. The half-round threaded portion 7 being in engagement with the shafts 8, the sleeves 4 are moved in unison longitudinally of the record-cylinders, the vibrations of the transmitter being reproduced in all the cores of the several solenoids which carry the cutting-points or stylus, hence making on each of the cylinders a faithful duplicate of the sound-record of the master-cylinder. When the record is completed, the catch 18 is withdrawn from the engaging position with the arm 17 and the arm 15 tilted back, so as to permit of the withdrawal of the cylinders, and the rail 27 is depressed, so as to bring the stylus

out of engagement with the cylinders. The half-round threaded portion 7 is depressed out of engagement with the threaded shaft 8 and the sleeves drawn back to their original position, where the part 7 engages again the shaft 8, the track being again raised after a new cylinder has been placed in position, when the operation is repeated.

What I claim as new is—

1. In an apparatus for duplicating or multiplying sound-records, the combination of a master-record, a transmitter coacting therewith, a phonogram-blank, a stylus located in proximity to said blank, a coil adapted to operate said stylus and which is controlled from the transmitter coacting with the master-cylinder, an arm carrying said coil, said arm being pivoted at one end, a track for supporting said arm at the other end thereof and means consisting of pivoted and spring-pressed arms for moving said track to remove said stylus from the blank.

2. In an apparatus for duplicating or multiplying sound-records, the combination of a master-record, a transmitter coacting therewith, a phonogram-blank, a stylus located in close proximity to said blank, a coil adapted to operate said stylus and which is controlled from the transmitter coacting with the master-cylinder, an arm carrying said coil, said arm being pivoted at one end, a track for supporting said arm at the other end thereof, and means for permitting of a relative movement between said track and the blank to remove the stylus therefrom.

3. The combination with a phonogram-blank, of a stylus located in proximity to said blank, a coil adapted to operate said stylus, an arm carrying said coil, said arm being pivoted at one end, a track for supporting said arm at the other end thereof, and means consisting of pivoted and spring-pressed arms for moving said track to remove said stylus from the blank.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

GIANNI BETTINI.

Witnesses:

ERNST HOPKINSON,
S. ROBERTS.



W. PEISKER.
PHONOGRAPH.

(Application filed Jan. 9, 1901.)

(No Model.)

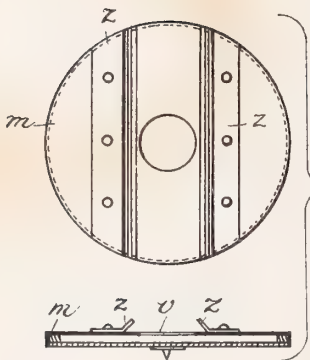
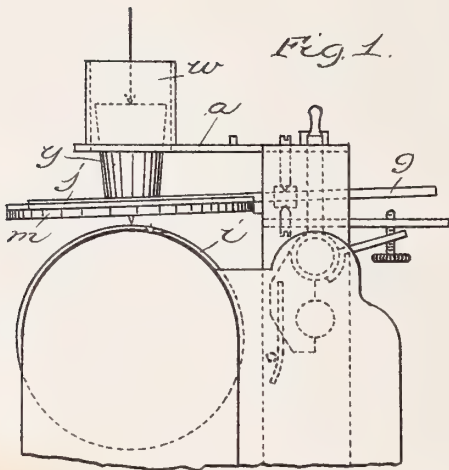


Fig. 2.

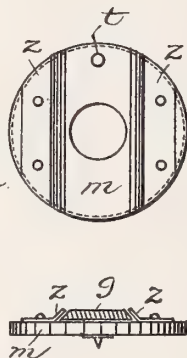


Fig. 3.

Witnesses:

E. H. Bolton

[Signature]

Inventor:

Wilhelm Peisker

By

[Signature] Richards

his Attorneys.

UNITED STATES PATENT OFFICE.

WILHELM PEISKER, OF BERLIN, GERMANY.

PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 688,965, dated December 17, 1901.

Application filed January 9, 1901. Serial No. 42,619. (No model.)

To all whom it may concern:

Be it known that I, WILHELM PEISKER, a subject of the Emperor of Germany, and a resident of Berlin, Germany, have invented certain new and useful Improvements in Phonographs, of which the following is a specification.

My invention relates to means for holding the diaphragm-frame in place; and it consists in the features and combinations of parts hereinafter described, and particularly pointed out in the claims.

The invention is illustrated in the accompanying drawings, in which—

Figure 1 is a side elevation; Fig. 2, a plan view of the diaphragm-frame; Fig. 2^a, a sectional view of the same; Figs. 3 and 3^a, similar views of a modification.

In Fig. 1 a tube-socket *w* is held by a feeding arm *a*. In the socket a shell or sound feeding tube *y* is arranged so as to permit up-and-down movement, and the lower extremity of said tube is journaled on a movable rail *g*. By means of this arrangement the sound jacks or diaphragms illustrated in Figs. 2 and 3 may be temporarily connected to or exchanged on the rail. In the diaphragm, as represented in Fig. 2, *m* is a frame, to the rear end of which two parallel clamps *Z Z* are connected. By the spring action of these clamps the frame *m* is held below the feeding system shown in Fig. 1 by its rear side.

Fig. 3 is illustrative of the structural principle whereby a coupling of the sound-box and the sound-transmission system is effected. In this case a pin *t* serves as a ledge for the frame *m*, so as to bring the sound-opening *v* into secure connection with the sound transmission or feed *y*.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In combination with means for transmitting the sound, a diaphragm-frame having projecting spring-clamps on its rear side, and means for engaging the said clamps and holding the diaphragm in place, substantially as described.

2. A diaphragm-frame having means on its rear side to attach the same to a support said means having a sliding connection with its support, substantially as described.

3. In combination with a supporting-arm, a diaphragm-frame having the attaching-clamps and a stop *t* to position the diaphragm in relation to the arm, substantially as described.

In witness whereof I have hereunto set my hand in presence of two witnesses.

WILHELM PEISKER.

Witnesses:

HENRY HASPER,
WOLDEMAR HAUPT.

1711 N



No. 689,117.

Patented Dec. 17, 1901.

A. N. PETIT.

DUPLICATE SOUND RECORD CYLINDER FOR PHONOGRAPHS.

(Application filed Mar. 18, 1901.)

(No Model.)

Witnesses

Chas. H. Smith
J. Staib

Ademor n. Petit.

For L. W. Ferrell & Son *allys*

UNITED STATES PATENT OFFICE.

ADEMOR N. PETIT, OF NEWARK, NEW JERSEY.

DUPLICATE SOUND-RECORD CYLINDER FOR PHONOGRAPHS.

SPECIFICATION forming part of Letters Patent No. 689,117, dated December 17, 1901.

Original application filed December 8, 1900, Serial No. 39,127. Divided and this application filed March 18, 1901. Serial No. 51,595. (No model.)

To all whom it may concern:

Be it known that I, ADEMOR N. PETIT, a citizen of the United States, residing at Newark, in the county of Essex and State of New Jersey, have invented an Improvement in Duplicate Sound-Record Cylinders for Phonographs and Similar Machines, of which the following is a specification.

My present application is a division of my application for Letters Patent filed December 8, 1900, Serial No. 39,127.

My invention relates to a new article of manufacture—that is, a duplicate sound-record cylinder for phonographs and similar machines, made in a matrix.

In carrying out my invention the duplicate sound-record is composed of a surface film or body of suitable material carrying a record of sound and a foundation of a different or inexpensive material connected thereto by cementing adhesion under heat and pressure. For this surface film I prefer to employ celluloid and for the foundation an inexpensive material of any desired character, such as celluloid loaded with pigment to give body and carrying a surface impregnation of a material of a solvent nature, such as amyl acetate, for the celluloid, the parts being connected together by cementing adhesion under heat and pressure. For this surface film I may also employ gelatin, lac, glue, gum, collodion, or similar material. For these materials there is one or more solvents, and the foundation carries a surface impregnation of a solvent, such as is employed for the surface film. Consequently when in the manufacture heat and pressure are employed the heat softens the foundation, as well as the surface film, and causes an action of the solvents of the film and foundation, which acting together with the heat and pressure have a cementing adhesion to permanently connect the surface film and the foundation.

The method of manufacturing this duplicate sound-record cylinder is set forth in my aforesaid application, and while I do not limit myself to the method employed for manufacturing the same the method employed in said application is the preferable one.

In the drawings, Figure 1 is a vertical section of an apparatus adapted for the manu-

facture of my duplicate sound-record cylinder and showing a cylinder with plain ends. Fig. 2 is a partial vertical section of the apparatus, showing the cylinder with inturned ends or flanges. Fig. 3 is a broken section of a cylinder such as is shown in the apparatus Fig. 1, and Fig. 4 a broken section of a cylinder such as is shown in the partial section of the apparatus Fig. 2.

The apparatus is described in an application of like date herewith, and while I prefer this form of apparatus I do not limit myself thereto. The improved apparatus in which this article of manufacture is made comprises a cylindrical matrix *a*, a head *b*, connected by a threaded flange to one end of the said matrix, and a base *c*, connected also by a threaded flange to the other end of the said matrix in a similar manner, there being packings preferably between the ends of the matrix and the inner surface of the head and base, so as to secure a tight joint against steam and compressed air. The base *c* is preferably provided with an exit-opening 2 and an escape-cock 3, and the head is preferably provided with a central opening, to which is connected a pipe 4, and a three-way cock *d* is connected to the pipe 4, and from the opposite sides of this there are a steam-pipe 6 and a pipe 7 for compressed air.

8 represents the surface-film duplicate sound-record, and 9 the foundation or cylindrical shell. The apparatus is preferably made, as shown, with annular grooves to receive the ends of the foundation, with the object of insuring the steam and air pressure doing the work and preventing the same getting in between the foundation and skin. With the matrix separated and disconnected from the head and base the inner surface of the matrix is to be coated to any desired thickness by a material such as hereinbefore set forth and in a fluid state. This material may be applied by a brush or by centrifugal action, or both, so as to impart to the matrix-surface an even homogeneous film until the desired thickness is obtained, after which said film is preferably allowed to set or dry, so as to yield an impression of the matrix. The film thus obtained is firm, dense, and yet flexible. The foundation 9 or cylindrical

shell should fit closely within the film thus formed upon the surface of the matrix, and this foundation may be made with integral inturned ends or flanges or not. Figs. 1 and 3 show the duplicate sound-record cylinder without inturned ends, while Figs. 2 and 4 show the foundation with inturned ends, and in the article I do not limit myself to the form of the ends. In the operation of manufacture and after the film is formed and the foundation placed within the same and the parts of the apparatus connected up, as shown in Fig. 1, steam is admitted within the matrix through the pipe 6, the three-way cock *d*, and the pipe 4, so as to soften the foundation and the surface film upon the matrix, and the steam being of pressure expands the foundation, bringing the same into intimate contact with the surface film, and the foundation and the film are united by the cementing adhesion of heat and pressure. This action is made all the more sure and positive where the surface of the foundation is impregnated with a solvent material of the same character as that employed in the surface film. After the heat has been maintained, together with the steam, a sufficient time the same is turned off at the three-way cock, and compressed air is admitted by the pipe 7, the escape-cock 3 being opened to drive out the steam until the compressed air entirely fills the space within the matrix, when the three-way cock is closed and the compressed air admitted of full force. The pressure of the compressed air is maintained within the matrix to hold the duplicate sound-record in shape until the same is thoroughly cooled and set, and this operation may be facilitated by the application of a cold or a cooling liquid to the exterior of the matrix or entire apparatus. This cooling action produces a slight shrinking in the duplicate sound-record cylinder, so that after the head or base is separated from the matrix the cylinder is readily removed therefrom.

I claim as my invention—

1. As a new article of manufacture, a duplicate sound-record cylinder composed of a surface film of suitable material carrying a record of sound and a foundation of a different and

inexpensive material connected thereto by cementing adhesion under heat and pressure, substantially as set forth.

2. As a new article of manufacture, a duplicate sound-record cylinder composed of a surface film of celluloid carrying a record of sound and a foundation of inexpensive material carrying a surface impregnation of a material of a solvent nature connected thereto by cementing adhesion under heat and pressure, substantially as set forth.

3. As a new article of manufacture, a duplicate sound-record cylinder composed of a surface film of suitable material carrying a record of sound and a foundation of inexpensive material carrying a surface impregnation of the same solvent material as that employed for the surface film connected thereto by cementing adhesion under heat and pressure, substantially as set forth.

4. As a new article of manufacture, a duplicate sound-record cylinder composed of a surface film of suitable material and a foundation of a different and inexpensive material connected thereto by cementing adhesion under heat and pressure, substantially as set forth.

5. As a new article of manufacture, a duplicate sound-record cylinder composed of a surface film of celluloid and a foundation of inexpensive material carrying the surface impregnation of a material of a solvent nature connected thereto by cementing adhesion under heat and pressure, substantially as set forth.

6. As a new article of manufacture, a duplicate sound-record cylinder composed of a surface film of suitable material and a foundation of inexpensive material carrying a surface impregnation of the same solvent nature as that employed for the surface film connected thereto by cementing adhesion under heat and pressure, substantially as set forth.

Signed by me this 13th day of March, 1901.

ADEMOR N. PETIT.

Witnesses:

GEO. T. PINCKNEY,
S. T. HAVILAND.

UNITED STATES PATENT OFFICE.

ADEMOR N. PETIT, OF NEWARK, NEW JERSEY.

METHOD OF MAKING DUPLICATE SOUND-RECORDS FOR PHONOGRAPHS.

SPECIFICATION forming part of Letters Patent No. 689,118, dated December 17, 1901.

Application filed March 23, 1901. Serial No. 52,472. (No model.)

To all whom it may concern:

Be it known that I, ADEMOR N. PETIT, a citizen of the United States, residing at Newark, in the county of Essex and State of New Jersey, have invented an Improvement in Methods of Making Duplicate Sound-Records for Phonographs and Similar Machines, of which the following is a specification.

Heretofore matrices have been made of original sound-records, and duplicates have been prepared from such matrices; and my present invention relates to the method of making duplicate sound-records from matrices of an original or master record.

15 In carrying out my invention I employ a blank formed from such materials or compositions as celluloid, gelatin, lac, glue, gum, collodion, or similar materials. The blank may be a disk or cylinder, and when the blank is in the form of a cylinder it is immaterial whether the same be provided with inturred ends or flanges or not, as this forms no necessary part of the present invention. The surface of this blank contains substances acting not only to soften the same, but otherwise to alter and change the character of the surface and to rearrange or change the molecular character of the material. This condition of the surface may be brought about in either one of two ways, namely: The surface may be treated by a mixture of a solvent for the material of which the blank is formed, together with a fatty material, or the fatty material may be added to the solvent and base in the manufacture of the blank. In the first instance the surface only is affected, permeated, and changed, while in the second instance the entire blank is affected and permeated. The preparation of the blank in the latter instance is advantageous over the former instance only in the point of cheapness, the result being to all intents and purposes absolutely the same. In the method employed by me this blank is placed against a matrix, which it closely fits, and in a suitable apparatus heat and pressure are employed to soften the blank and expand the same and also to force its surface into minute and intimate contact with the surface of the matrix. The heat passes through the blank from within outward and softens the same, and with

the application of pressure to expand the blank and to force its surface into intimate contact with the matrix the softened surface will completely fill all of the delicate interstices and conformations of the matrix, imparting to the surface of the blank a positive of the negative surface of the matrix. Where the surface only has been treated, the same is softened to a slightly-greater extent than the other portions of the blank, it being especially advantageous that the surface should be caused to closely conform to the interstices of the matrix. Where the blank is of celluloid or collodion, I prefer to employ for the treatment of the same a solvent and fatty matter, as set forth in the United States patent granted to me December 4, 1900, No. 662,981. Where the blank is of gelatin, lac, glue, gum, or other similar material, a substance comprising a solvent and other suitable material is to be employed that is capable of treating the blank to alter and change its character or molecular structure in a manner similar or substantially identical with the operation performed by the solvent and fatty matter upon the blank where the same is formed of celluloid. I do not, however, limit myself in the present instance to the materials employed for this purpose nor to the fact of the blank being in the form of a disk or of a cylinder, as the method is equally applicable to either a disk or cylinder.

In the drawings, Figure 1 is a vertical section of an apparatus adapted for the carrying out of my improved method. Fig. 2 is a partial vertical section representing a slight modification. Fig. 3 is a vertical section representing a further modification, and Figs. 4 and 5 are broken sectional views of the blank in the form of a duplicate sound-record cylinder.

The apparatus for carrying out the method herein described and forming the duplicate sound-record cylinder preferably comprises a matrix *a*, which matrix may be made in any manner well known in the art, a head *b*, connected by a threaded flange to one end of the said matrix, and a base *c*, connected also by a threaded flange to the other end of the matrix in a similar manner, there being packings preferably between the ends of the ma-

trix in the inner surface of the head and base, so as to insure a tight joint. The base *c* is preferably provided with an exit-opening 2 and escape-cock 3, and the head is preferably provided with a pipe 4, connecting with a central opening through the head, and a three-way cock *d*, connected to the pipe 4, and from the opposite side of which there are a steam-pipe 6 and a pipe 7 for compressed air.

In Figs. 1 and 4, 8 represents a duplicate sound-record cylinder with plain ends, and 9 in Figs. 2 and 5 represents a duplicate sound-record cylinder with inturned ends or flanges. I prefer to employ within the head and base in the apparatus annular grooves to receive the ends of the foundation, with the object of insuring the steam and air pressure doing the work and preventing the same getting in between the cylindrical blank and the surface of the matrix.

The modification Fig. 3 illustrates the application of my improved method to the treatment of a disk blank. In this modification the matrix *a'* forms the bottom portion of a body, in which 10 forms the upper or cup-shaped portion, to which the matrix is attached, preferably, by a screw-joint with a washer, there being in this case also an annular groove in the base of the portion 10 to receive the edges of the disk blank 12.

The blank, whether a disk or cylinder, prepared in the manner hereinbefore set forth is to be placed in proximity to the matrix and the parts of the apparatus connected and steam admitted by the pipe 6, three-way cock, and pipe 4 into the space or cavity within the apparatus. The disk blank lies against the surface of the matrix, and the blank cylinder fits closely within the matrix. The edges of the disk blank are held in the annular grooves, and the edges of the cylindrical blank are also held in the annular grooves, and the cylinder may be provided with inturned ends or not. The heat of the steam admitted into the cavity or space within the apparatus softens the blank from the back outward, and the pressure of the steam tends not only to expand the blank, but to force the same against the matrix and cause the softened surface to closely fill all the delicate interstices of the matrix and to accurately conform to the negative record of sound thereon. Where the surface only of the blank is treated, the heat of the steam has a greater softening action thereon than on the other portions forming the blank, and this facilitates the material of the blank closely conforming to the negative of the matrix.

Where the entire blank is treated, the action is the same as where only the surface is treated; but the heating action consumes slightly less time, because in this instance the blank is slightly softer in its entire composition than where the surface only is treated. After sufficient time has elapsed for the action of the heat upon the blank the steam is closed off and compressed air admitted, the

escape-cock 3 being preferably opened for a short period to permit of the escape of the steam remaining in the apparatus.

The pressure of compressed air is maintained to hold the blank into intimate contact with the surface of the matrix until the same cools and sets and is sufficiently hard to warrant the removal. This cooling action is advantageously facilitated by submerging the apparatus into a bath of cold water or subjecting the same to external cold of a dry character. The action of the cold is to suddenly chill the matrix and blank and cause a slight contraction of the blank from the matrix. After the parts are cooled and the duplicate sound-record, formerly a blank, is sufficiently set the compressed air is turned off and the parts of the apparatus are separated and the duplicate sound-record removed.

The method herein described is applicable alike to a blank whether the same be in the form of a disk or a cylinder and whether the same be of celluloid or of other suitable material, as hereinbefore set forth.

I do not limit myself either to the form of the blank or to the materials of which the same is composed.

I claim as my invention—

1. The method herein specified of making duplicate sound-records consisting in taking a blank having a surface treated by substances acting not only as solvents to soften the same, but to alter and change the molecular character thereof, inserting said treated blank into a suitable apparatus and upon a matrix embraced therein, applying in the apparatus and upon the blank heat and pressure to soften the blank and its surface and to force the same into intimate contact with the surface of the matrix and maintaining the pressure until the blank is set and thereafter removing the same from the apparatus and matrix, substantially as set forth.

2. The method herein specified of making duplicate sound-records, consisting in taking a blank having a surface treated by substances acting not only as solvents to soften the same but to alter and change the molecular character thereof, inserting said treated blank into a suitable apparatus and upon a matrix embraced therein, applying within the apparatus and upon the blank heat and pressure to soften the blank and its surface and to expand the same into intimate contact with the surface of the matrix and maintaining the pressure and applying cold to the apparatus to cause the duplicate sound-record to set, and thereafter removing the same from the apparatus and matrix, substantially as specified.

3. The method herein specified of making duplicate sound-records, consisting in taking a blank treated by a solvent and a fatty matter to soften the surface and to alter and change the molecular character thereof, inserting said treated blank into an apparatus and against the surface of a matrix forming

a part thereof, applying within the apparatus and upon the blank heat and pressure to soften the blank and its surface and to expand and force the same into intimate contact with the surface of the matrix and maintaining the pressure until the same is set, and thereafter removing the same from the matrix, substantially as set forth.

4. The method herein specified of making duplicate sound-records, consisting in taking a blank treated by a solvent and a fatty matter to soften the surface and to alter and change the molecular character thereof, inserting said treated blank into an apparatus and against the surface of a matrix forming a part thereof, applying within the apparatus and upon the blank heat and pressure to soften the blank and its surface and to expand and force the same into intimate contact with the surface of the matrix and maintaining the pressure and applying cold to the apparatus to cause the duplicate sound-record to set and thereafter removing the same from the matrix, substantially as set forth.

5. The method herein specified of making duplicate sound-record cylinders, consisting in taking a blank cylinder of celluloid in which the surface of the celluloid is treated with a mixture of a solvent and a fatty matter to soften the surface and alter and change the molecular character thereof, placing the treated blank cylinder into a matrix, applying within the matrix and within the treated cylinder of celluloid heat and pressure to soften the celluloid and its treated surface and to expand and force the same into intimate contact with the surface of the matrix to impart from the negative matrix a positive impression to the celluloid cylinder for making a duplicate sound-record, maintaining the pressure within the matrix until the celluloid cylinder is sufficiently set to maintain its shape, and thereafter separating the duplicate sound-record cylinder from the matrix, substantially as set forth.

6. The method herein specified of making duplicate sound-record cylinders, consisting in taking a blank cylinder of celluloid in which the surface of the celluloid is treated with a mixture of a solvent and a fatty matter to soften the surface and to alter and change the molecular character thereof, placing the treated blank cylinder into a matrix, applying within the matrix and within the treated cylinder of celluloid heat and pres-

sure to soften the celluloid and its treated surface and to expand and force the same into intimate contact with the surface of the matrix to impart from the negative matrix a positive impression to the celluloid cylinder for making a duplicate sound-record, maintaining the pressure within the matrix, applying cold to the matrix to cause the duplicate sound-record cylinder to set and thereafter separating the duplicate sound-record cylinder from the matrix, substantially as set forth.

7. The method herein specified of making duplicate sound-record cylinders, consisting in taking a blank cylinder of celluloid treated by a mixture of a solvent and a fatty matter to soften the surface and to alter and change the molecular character thereof, placing the treated blank cylinder into a matrix, applying within the matrix and within the treated blank heat and pressure to soften the celluloid blank and force the same into intimate contact with the surface of the matrix to impart from the negative matrix a positive impression to the celluloid cylinder for making from the blank a duplicate sound-record, maintaining the pressure within the celluloid cylinder until the same is sufficiently set to maintain its shape, and thereafter separating the said duplicate sound-record cylinder from the matrix, substantially as set forth.

8. The method herein specified of making duplicate sound-record cylinders, consisting in taking a blank cylinder of celluloid treated by a mixture of a solvent and a fatty matter to soften the surface and to alter and change the molecular character thereof, placing the treated blank cylinder into a matrix, applying within the matrix and within the treated blank heat and pressure to soften the celluloid blank and to force the same into intimate contact with the surface of the matrix to impart from the negative matrix a positive impression to the celluloid cylinder for making from the blank a duplicate sound-record, maintaining the pressure within the celluloid cylinder and applying cold to the matrix to cause the duplicate sound-record cylinder to set and thereafter separating the said duplicate sound-record cylinder from the matrix, substantially as set forth.

Signed by me this 18th day of March, 1901.

ADEMOR N. PETIT.

Witnesses:

GEO. T. PINCKNEY,
S. T. HAVILAND.

No. 689,124.

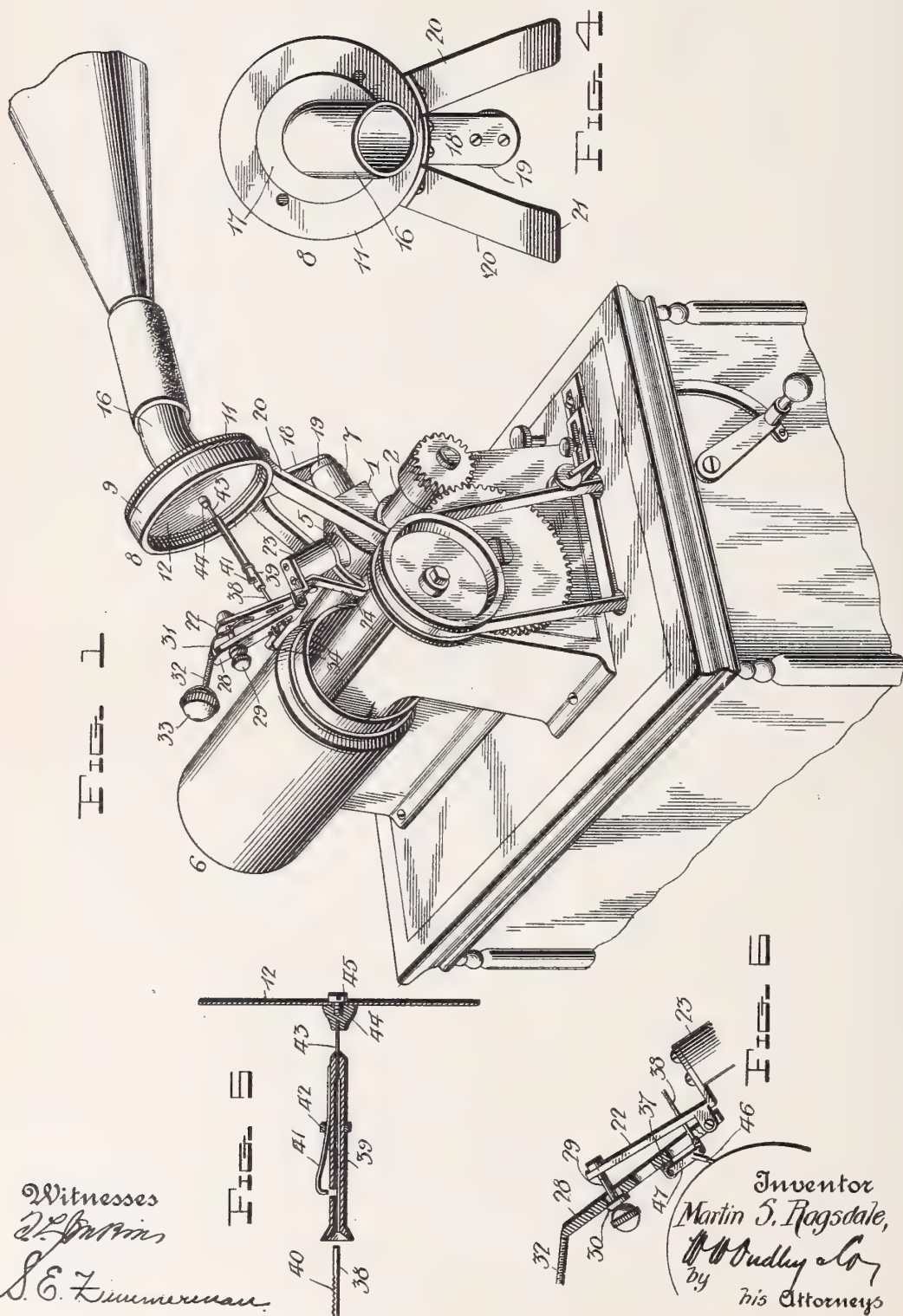
Patented Dec. 17, 1901.

M. S. RAGSDALE.
GRAPHOPHONE.

(Application filed Sept. 16, 1901.)

(No Model.)

2 Sheets—Sheet 1.



Witnesses
W. J. Harris
S. E. Zimmerman

Inventor
Martin S. Ragdale,
W. Dudley Coy
by
his Attorneys

M. S. RAGSDALE.
GRAPHOPHONE.

(Application filed Sept. 18, 1901.)

(No Model.)

2 Sheets—Sheet 2.

FIG. 2

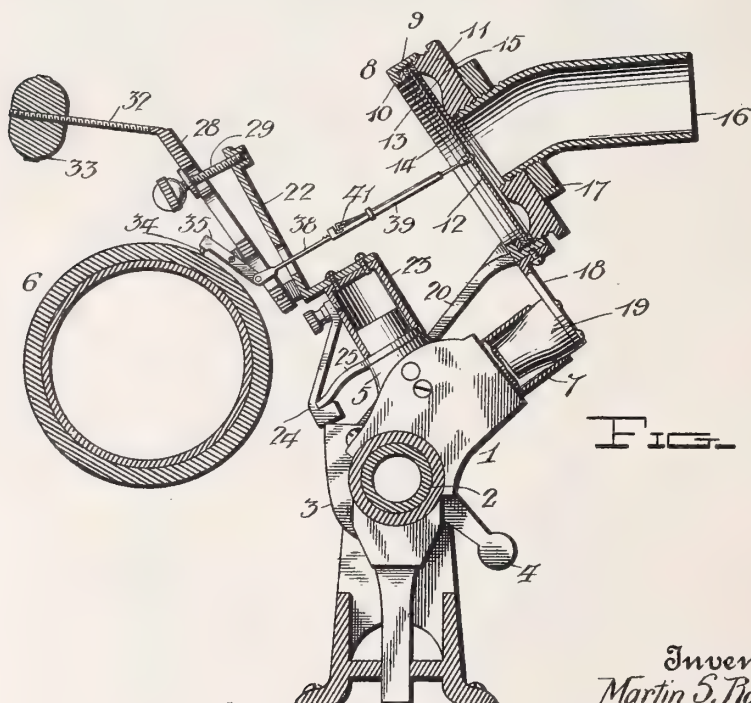
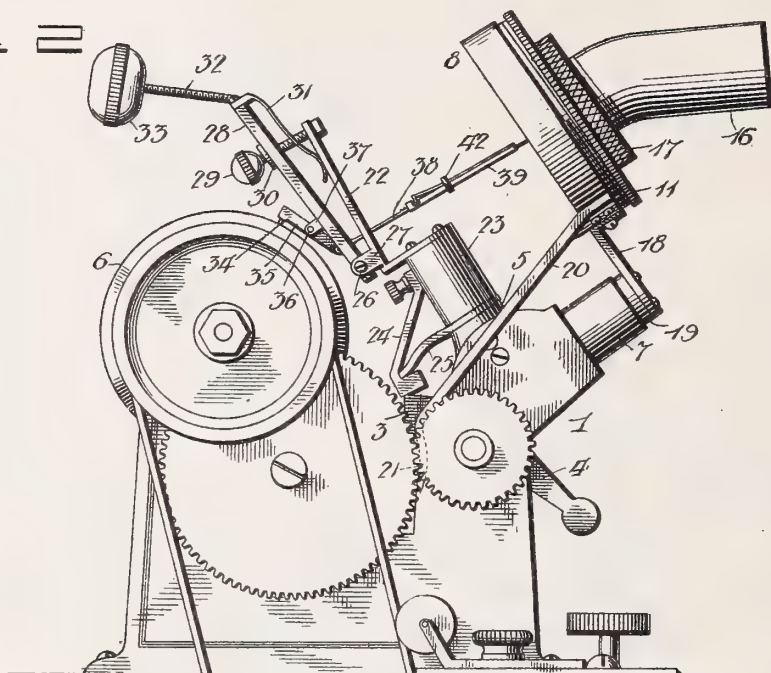


FIG. 3

Witnesses
J. E. Prothro
S. E. Zimmerman

Inventor
Martin S. Ragdale
By *W. Dudley Co.*
His Attorneys

UNITED STATES PATENT OFFICE.

MARTIN S. RAGSDALE, OF PETWORTH, DISTRICT OF COLUMBIA, ASSIGNOR
OF ONE-HALF TO FRANK X. BOUCHER AND FRANK FOSTER, OF WASHINGTON, DISTRICT OF COLUMBIA.

GRAPHOPHONE.

SPECIFICATION forming part of Letters Patent No. 689,124, dated December 17, 1901.

Application filed September 16, 1901. Serial No. 75,571. (No model.)

To all whom it may concern:

Be it known that I, MARTIN S. RAGSDALE, a citizen of the United States, residing at Petworth, in the District of Columbia, have invented certain new and useful Improvements in Graphophones; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the figures of reference marked thereon, which form a part of this specification.

This invention relates to certain new and useful improvements in graphophones, phonographs, and the like, and has for its object, primarily, the reproduction of recorded sound free from the rasp and harshness and other objectionable sound transformations produced by existing machines.

Another object of the invention is the preservation of the record-cylinders while in use from strain and wear by relieving them of undue pressure, whereby their period of usefulness is greatly prolonged and their utility largely enhanced.

Other advantages possessed by the invention are set forth in the following description, which is directed to the details of construction and operation and in connection with which attention is called to the accompanying drawings, illustrative of the preferred way in which the invention is carried into effect.

In the drawings, Figure 1 is a perspective view of the improvement applied to a graphophone. Fig. 2 is a side elevation of the same. Fig. 3 is a transverse sectional view. Fig. 4 is a rear elevation of the sound-box. Fig. 5 is an enlarged sectional view of the diaphragm and its connection with the stylus. Fig. 6 is a detail sectional view of a recording device embodying the invention.

Referring to the drawings by numerals, 1 represents the carriage, slidably mounted on the guide-tube 2 and moved by suitable means, such as the usual feed-screw, segmental nut, and the ring 3, the latter being manipulated through its handle 4 to disengage the nut and screw and elevate the reproducer. On the carriage is pivoted a tubular arm 5, which extends in the direction of the recording-cyl-

der 6, and 7 denotes a socket-piece extending from the carriage at the front thereof.

The sound-box 8, which is of peculiar construction, consists of a cylindrical casing 9, having at its rear side an inwardly-extending flange 10, between which and a nut 11 the diaphragm 12 is tightly clamped, the nut having threads which engage threads on the inner side of the casing. Interposed between the flange 10 and the diaphragm is a metallic ring 13 and also preferably a rubber or other ring 14, and between the diaphragm and the inner side of the nut is a beaded metallic ring 15. The nut is centrally apertured and threaded to receive the threaded end of a tube 16, to which is attached the horn or the ear-piece tube, and 17 is a jam-nut to maintain the joint. The sound-box is mounted on and supported wholly by the carriage. Depending from the casing 9 is an arm 18, and projecting from the lower end thereof is a tapered plug 19, which enters the socket 7 of the carriage. Secured to the casing at the sides of the arm 18 are two spring-arms 20 20, which extend at an inclination and terminate in bent ends 21 to engage the rear side of the sleeve portion of the carriage, whereby the sound-box is firmly secured to but easily removed from the carriage.

22 denotes a bracket having at its lower end a tube 23, removably fitted on the upper end of the pivoted arm 5. A pivoted laterally-swinging hook 24 on the tube 23 is brought into engagement with the end of the arm 25 on the pivoted arm 5 to secure the bracket 22 to the latter. The lower end of the hook 24 is engaged by the shoulder on the ring 3, whereby movement of the ring effects the raising and lowering of the bracket. Toward the lower end of the bracket is pivoted, by means of screws 26, passed through ears 27, a bar 28, having slots, through the upper one of which is passed an adjusting-screw 29, the end of the screw engaging a threaded opening in the bracket. A rubber or other ring 30 is interposed between the head of the screw 29 and the bar 28, and 31 is a light spring carried by the bar and pressing at its free end against the bracket to force the latter against the screw-head. Extending at an angle rearwardly from the upper end of the

bar is a threaded stem 32, and 33 is a weight adjustable on said stem.

The reproducing-stylus 34 is fixed to the outer end of a lever 35, pivoted intermediate of its ends on a pin 36, which is passed through ears 37 on the bar. To the other end of the lever is pivoted a rod 38, which is passed through the lower slot of the bar and enters the opening of a tubular rod 39, the outer end of the latter being flared and the opening tapered to facilitate the entrance of the rod. The rod is provided along its upper side with teeth 40, engaged by a spring-catch 41, carried by the tubular rod 39, and which is depressed to engage the toothed rod by the movement of a ring 42. A flexible wire 43 connects the inner end of the tubular rod with the diaphragm 12, the ends of the wire being fastened to said rod and to a clamping-piece 44, between which latter and the head of a screw 45 the diaphragm is firmly clamped.

The recording-stylus 46 (shown in Fig. 6) is fixed to a lever 47 intermediate of the end thereof, and said lever is fulcrumed at its outer end to the ears 37 to bring the stylus into proper recording relation to the cylinder. It will be observed that the sound-box is supported wholly by the carriage and that therefore the record-cylinder is entirely relieved of its weight, with the resultant advantages above stated. The pressure exerted by the stylus against the record-cylinder is readily controllable, being produced by the slight inherent weight of the parts, but mainly by the weight 33 and the bar 28. The bar and weight are shiftable, and consequently the pressure of the stylus may be nicely adjusted. The connection between the stylus and diaphragm is practically direct, whereby lost motion is avoided and very sensitive transmissions obtained. The adjustability of the connection between the stylus and diaphragm enables proper positioning of the stylus, despite variations of angle of the supporting-bar 28 to regulate the pressure, which adjustment may be easily and quickly effected, due to the simplicity of construction. The flexible connection between the rod 39 and diaphragm enables the requisite play of the parts without affecting the vibratory movements of the diaphragm, the support for which is rigid, and also obviates the necessity for great care and skill in assemblage. But little time and no especial skill are required to convert the reproducer into a recorder, and vice versa, and when changed to record the improvement possesses all of the advantages described in connection with the reproducer.

My improvements may be applied to existing machines without structural modifications and are adapted for use in connection with any type of sound-reproducing appliances.

I claim as my invention—

1. In a graphophone or the like, the combi-

nation of a traveling carriage having separate supports, a sound-box having a diaphragm and mounted upon one of the supports, stylus mechanism supported on the other support, and means connecting the stylus mechanism with the diaphragm. 70

2. In a graphophone or the like, the combination of a traveling carriage having separate supports, a sound-box having a diaphragm and mounted upon one of the supports, stylus mechanism supported on the other support, and an adjustable connection between the stylus mechanism and the diaphragm. 75

3. In a graphophone or the like, the combination of a traveling carriage having separate supports, a sound-box having a diaphragm and mounted upon one of the supports, stylus mechanism supported on the other support, and a flexible connection between the stylus mechanism and the diaphragm. 80 85

4. In a graphophone or the like, the combination of a traveling carriage having separate supports, a sound-box having a diaphragm and mounted upon one of the supports, stylus mechanism supported on the other support, and a flexible adjustable connection between the stylus mechanism and the diaphragm. 90

5. In a graphophone or the like, the combination of a traveling carriage having separate supports, a sound-box having a diaphragm and mounted upon one of the supports, stylus mechanism supported on the other support, means for varying the pressure of the stylus mechanism against the record-cylinder, and a connection between the stylus mechanism and diaphragm. 95 100

6. In a graphophone or the like, the combination of a traveling carriage having separate supports, a sound-box having a cushioned diaphragm and mounted upon one of the supports, stylus mechanism including a cushioned support for the stylus supported on the other support, and a flexible connection between the stylus mechanism and diaphragm. 105 110

7. In a graphophone or the like, the combination of a bracket, a bar pivoted at its lower end thereto, an adjusting-screw connecting the bar and bracket at their upper ends, a stem extending from the bar, a weight adjustable on the stem, a stylus-lever pivoted on the bar, a diaphragm, and an adjustable connection between the lever and diaphragm. 115

8. In a graphophone or the like, the combination of a diaphragm, a stylus-lever, a toothed rod pivoted to the lever, a tubular rod fixed by a flexible wire to the diaphragm and telescoping with the toothed rod, a spring-catch on the tubular rod, and means for moving the catch to engage the toothed rod. 120 125

In testimony whereof I affix my signature in presence of two witnesses.

MARTIN S. RAGSDALE.

Witnesses:

W. T. NORTON,
A. BROWNING.

1-41

No. 689,349.

Patented Dec. 17, 1901.

E. BERLINER.

APPARATUS FOR PRODUCING SOUND RECORDS.

(Application filed May 14, 1901.)

(No Model.)

2 Sheets—Sheet 1.

Fig. 1.

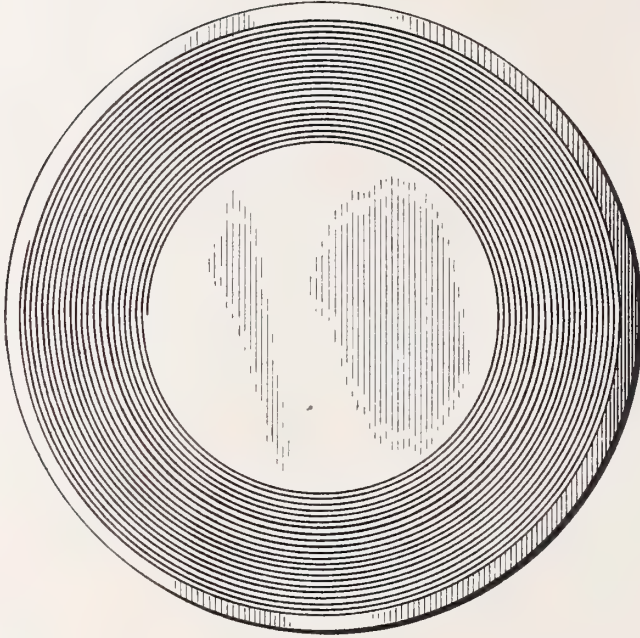
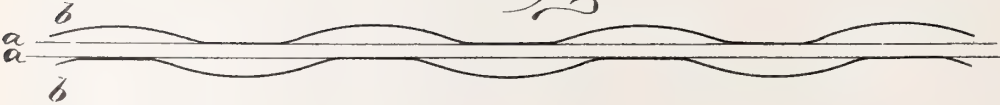


Fig. 2.



witnesses:
J. M. Fowler Jr.
H. T. Chapman.

Inventor.
Emile Berliner,
By Louis Bissing.
Atty's.

No. 689,349.

Patented Dec. 17. 1901.

E. BERLINER.

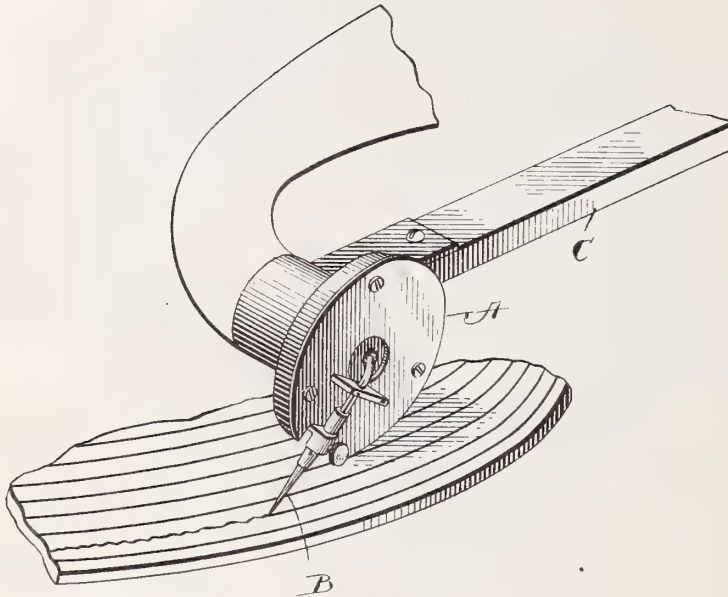
APPARATUS FOR PRODUCING SOUND RECORDS.

(Application filed May 14, 1901.)

(No Model.)

2 Sheets—Sheet 2.

Fig. 3.



Witnesses:
G. E. Marshall,
H. T. Chapman

Inventor,
Emile Berliner,
By Lyons Prising,
Attys

UNITED STATES PATENT OFFICE.

EMILE BERLINER, OF WASHINGTON, DISTRICT OF COLUMBIA, ASSIGNOR TO
UNITED STATES GRAMOPHONE COMPANY, OF WASHINGTON, DISTRICT
OF COLUMBIA, A CORPORATION OF WEST VIRGINIA.

APPARATUS FOR PRODUCING SOUND-RECORDS.

SPECIFICATION forming part of Letters Patent No. 689,349, dated December 17, 1901.

Application filed May 14, 1901. Serial No. 60,152. (No model.)

To all whom it may concern:

Be it known that I, EMILE BERLINER, a citizen of the United States, residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Apparatus for Producing Sound-Records, of which the following is a specification.

The object of my invention is to increase and extend the usefulness of gramophonic apparatus and to add another means for producing gramophonic records to those heretofore known. By my invention, in fact, I place it within the power of persons unskilled in the art of making sound-records to produce records of their own, and this without the use of other machinery than that which they are already supposed to possess for the purpose of reproducing such records. Thus, for instance, my invention renders it possible for the owner of a gramophone-machine, which can now be purchased in the open market at a moderate price, but can ordinarily be used for reproducing purposes only, to make a record of business-letters, contracts, musical selections, and the like by means of said machine, thus using the gramophone as a recording-machine, and to thereafter translate such records into sound by the same apparatus which has been used to produce it.

To these ends my invention consists in the means for forming a preliminary groove in a gramophone-tablet and thereafter superposing the sound-record upon this groove; and my invention furthermore consists in the gramophone-tablets thus formed.

In the drawings, Figure 1 shows the gramophone-tablet with a preliminary groove formed therein, and Fig. 2 shows a portion of said groove as it appears after the sound-record has been superposed thereon. Fig. 3 shows a view of the recording-stylus and tablet.

In the practice of my invention I may start with the usual zinc plate covered with an etching-ground, as is commonly used in this art. This plate I place in any type of engraving-machine which can cut a smooth line or groove upon the face of the plate, the

shape of groove usually employed being that of a spiral. By preference I use for this purpose the recording-machine patented to me on September 19, 1895, under No. 534,543—that is to say, I place the zinc plate, covered with an etching-ground, in this machine, with the recording-stylus in position, and start the machine in motion, without, however, actuating its diaphragm by sounds uttered in the vicinity. In consequence the etching-ground of the plate will be removed along a smooth spiral line. I then place the plate in an etching-bath, and thus form a smooth spiral groove of appropriate depth in the material of the plate. As I have stated above, however, this groove might be formed in the etching-ground by any other type of engraving-machine, or it might be cut directly into the material of the plate by the action of the machine instead of first cutting it into the etching-ground and thereafter etching a groove upon the plate. From the zinc plate thus formed a mold or patrix is made, preferably after the fashion described in my Patent No. 548,623. The mold or patrix thus obtained is thereupon used to stamp a facsimile of the smooth-walled spiral groove of the zinc plate into the material of the ordinary gramophone record-plates as it exists before a sound-record has been impressed upon it—that is to say, the patrix is pressed against a flat plane-surfaced plate, usually of hard rubber.

By the means thus far described I produce, as will be seen, in any desired quantity hard-rubber record-plates of the kind now in use on gramophone-machines, but with a plain and smooth-walled spiral groove instead of a groove molded in accordance with sound-waves. Such a plate is shown in Fig. 1. It is obvious, of course, that these rubber plates with a smooth spiral groove could be made by cutting the groove directly into the material of the rubber plate by an engraving-machine instead of by the means above described. Such rubber or other record-plate with a preliminary spiral groove may now be sold to the users of gramophones or similar sound-reproducing apparatus. As is well

known, a gramophone is an apparatus which as ordinarily used translates a sound-record into sound; but it has heretofore not been possible for these reproducing-machines to record sound with any degree of commercial success directly upon the hard material of which the record-tablets are composed. This was partially due to the fact that such reproducing-machines are built in a light and inexpensive way, so as to more especially adapt them for the primary purpose for which they have heretofore been intended. I have discovered, however, that when a record-tablet with a preliminary groove of the kind above described is employed such gramophone-machines, even as now built and sold, may be successfully used as recorders. To this end a record-tablet with a preliminary smooth-walled spiral groove is placed in the gramophone-machine, which is then set in motion while sounds are produced in the neighborhood of its diaphragm. The stylus of the gramophone now acts as a recording-stylus to shape, indent, or impress the laterally-undulating sound-records on the wall of the preliminary spiral groove. The approximate shape of the groove as it then appears after the sound-record has been impressed thereon is shown in Fig. 2, the walls of the preliminary groove being denoted by *a a* and the walls of the completed groove being designated *b b*. A close inspection of the finished record reveals both grooves.

The stylus which is used to make the sound-record in the preliminary groove is generally somewhat broader at the point than that which was used to form the groove in the first plate—that is to say, the point of the recording-stylus is somewhat wider than the preliminary groove. The preliminary groove seems to have the function of guiding the record-stylus and, what is more important, of lessening the work required to be done by the recording-stylus in shaping or indenting the material of the record-plate, which would otherwise have to be shaped or indented by the recording-stylus. This makes it possible to use for recording purposes the light and inexpensive gramophone reproducing-machine which is principally designed for reproducing purposes instead of being compelled to use the heavy and comparatively expensive recording-machine.

I have found the shape of the record-groove as it finally appears in the record-tablet approximates the shape of such record-grooves as heretofore produced in accordance with the

plans laid down in any patents above referred to, and, what seems to be quite remarkable, I have discovered that whatever difference in shape or configuration there may be between gramophone-records produced in the old way and produced in accordance with this invention such differences are not sufficient to prevent the reproduction of sound. The theoretical reasons for this I am not prepared to state. It is clear, however, from what has been said that such tablets with sound-records impressed upon a preliminary groove by a machine primarily designed for reproducing purposes may now be used for the reproduction of the sound recorded thereon by the same machine.

The method I have described for making sound-records might also be carried out by forming the preliminary spiral groove in the zinc-plate as above described and thereupon superimposing a sound-record upon this preliminary groove in the zinc-plate itself. A mold or patrix made from such zinc plate could then be used to impress facsimiles of sound-records of the character shown in Fig. 2 upon the usual rubber record-plates.

The sound-box A and stylus B, as well as the arm C, on which they are mounted, and which are shown in Fig. 3, are of the usual construction common in the art and need no detailed description.

What I claim is—

1. The combination of a blank record-surface carrying a previously-formed plain, spiral or helical groove in the record material and a sound-recording stylus moving in and propelled solely by the groove and shaping the groove in accordance with sound-vibrations, substantially as described.

2. The combination of a record-tablet carrying a spiral groove and a sound-recording stylus moving in the groove and fashioning the same laterally in accordance with sound-vibrations, substantially as described.

3. The combination of a record-surface carrying a groove and a sound-recording stylus wider than the groove moving in the groove and shaping the same in accordance with sound-vibrations, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

EMILE BERLINER.

Witnesses:

J. JEROME LIGHTFOOT,
C. E. MARSHALL.

No. 689,350.

Patented Dec. 17, 1901.

E. BERLINER.

SOUND RECORD AND METHOD OF MAKING SAME.

(Application filed July 26, 1898.)

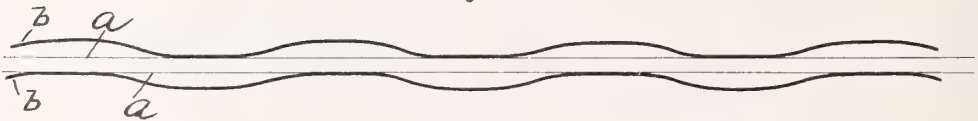
(No Model.)

2 Sheets—Sheet 1.

Fig. 1



Fig. 2.



Witnesses:

J. M. Fowler Jr.
J. T. Chapman.

Inventor:

Emile Berliner,
By Lyon & Birney
Attorneys.



No. 689,350.

Patented Dec. 17, 1901.

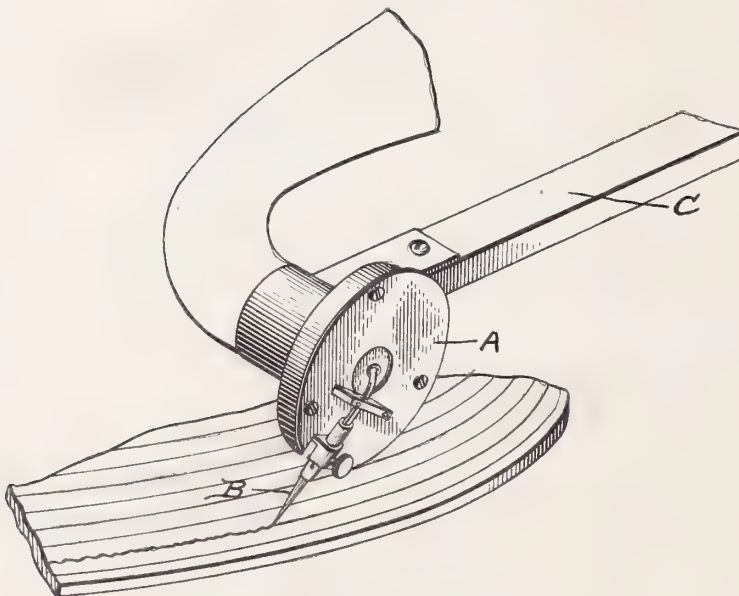
E. BERLINER.
SOUND RECORD AND METHOD OF MAKING SAME.

(Application filed July 26, 1898.)

(No Model.)

2 Sheets—Sheet 2.

Fig. 3.



Witnesses:
J. M. Fowler Jr.
F. J. Chapman

Inventor:
Emile Berliner
By Lyons & Bessing
Attorneys

UNITED STATES PATENT OFFICE.

EMILE BERLINER, OF WASHINGTON, DISTRICT OF COLUMBIA, ASSIGNOR TO UNITED STATES GRAMOPHONE COMPANY, OF WASHINGTON, DISTRICT OF COLUMBIA, A CORPORATION OF WEST VIRGINIA.

SOUND-RECORD AND METHOD OF MAKING SAME.

SPECIFICATION forming part of Letters Patent No. 689,350, dated December 17, 1901.

Application filed July 26, 1898. Serial No. 686,951. (No model.)

To all whom it may concern:

Be it known that I, EMILE BERLINER, a citizen of the United States, and a resident of Washington, in the District of Columbia, have
5 invented certain new and useful Improvements in Sound-Records and Methods of Producing the Same, of which the following is a specification.

The object of my invention is to increase
10 and extend the usefulness of gramophonic apparatus and to add another method of producing gramophonic records to those heretofore known. By my invention, in fact, I place it within the power of persons unskilled in the
15 art of making sound-records to produce records of their own, and this without the use of other machinery than that which they are already supposed to possess for the purpose of reproducing such records. Thus, for instance, my invention renders it possible for
20 the owner of a gramophone-machine, which can now be purchased in the open market at a moderate price, but can ordinarily be used for reproducing purposes only, to make a
25 record of business-letters, contracts, musical selections, and the like by means of said machine, thus using the gramophone as a recording-machine, and to thereafter translate such records into sound by the same apparatus which has been used to produce it.

To these ends my invention consists in the method of forming a preliminary groove in a gramophone-tablet and thereafter superposing the sound-record upon this groove;
35 and my invention furthermore consists in the gramophone-tablets thus formed.

In the drawings, Figure 1 shows the gramophone-tablet with a preliminary groove formed therein, and Fig. 2 shows a portion of
40 said groove as it appears after the sound-record has been superposed thereon. Fig. 3 shows a view of the recording-stylus and tablet.

In the practice of my invention I may start
45 with the usual zinc plate covered with an etching-ground, as is commonly used in this art. This plate I place in any type of engraving-machine which can cut a smooth line or groove upon the face of the plate, the
50 shape of groove usually employed being that

of a spiral. By preference I use for this purpose the recording-machine patented to me on September 19, 1895, under No. 534,543—that is to say, I place the zinc plate, covered with an etching-ground, in this machine, with
55 the recording-stylus in position, and start the machine in motion, without, however, actuating its diaphragm by sounds uttered in the vicinity. In consequence the etching-ground of the plate will be removed along a smooth spiral
60 line. I then place the plate in an etching-bath, and thus form a smooth spiral groove of appropriate depth in the material of the plate. As I have stated above, however, this
65 groove might be formed in the etching-ground by any other type of engraving-machine, or it might be cut directly into the material of the plate by the action of the machine instead of first cutting it into the etching-ground and thereafter etching a groove upon
70 the plate. From the zinc plate thus formed a mold or patrix is made, preferably after the fashion described in my Patent No. 548,623. The mold or patrix thus obtained
75 is thereupon used to stamp a facsimile of the smooth-walled spiral groove of the zinc plate into the material of the ordinary gramophone record-plate as it exists before a sound-record has been impressed upon it—that is to say, the patrix is pressed against a flat plane-
80 surfaced plate, usually of hard rubber.

By the means thus far described I produce, as will be seen, in any desired quantity hard-rubber record-plates of the kind now in use on gramophone-machines, but with a plain
85 and smooth-walled spiral groove instead of a groove molded in accordance with sound-waves. Such a plate is shown in Fig. 1. It is obvious, of course, that these rubber plates with a smooth spiral groove could be made
90 by cutting the groove directly into the material of the rubber plate by an engraving-machine instead of by the means above described. Such rubber or other record-plate with a preliminary spiral groove may now be
95 sold to the users of gramophones or similar sound-reproducing apparatus.

As is well known, a gramophone is an apparatus which as ordinarily used translates a sound-record into sound; but it has here- 100

tofore not been possible for these reproducing-machines to record sound with any degree of commercial success directly upon the hard material of which the record-tablets are composed. This was partially due to the fact that such reproducing-machines are built in a light and inexpensive way, so as to more especially adapt them for the primary purpose for which they have heretofore been intended. I have discovered, however, that when a record-tablet with a preliminary groove of the kind above described is employed such gramophone-machines, even as now built and sold, may be successfully used as recorders. To this end a record-tablet with a preliminary smooth-walled spiral groove is placed in the gramophone-machine, which is then set in motion while sounds are produced in the neighborhood of its diaphragm. The stylus of the gramophone now acts as a recording-stylus to shape, indent, or impress the laterally-undulating sound-records on the wall of the preliminary spiral groove. The approximate shape of the groove as it then appears after the sound-record has been impressed thereon is shown in Fig. 2, the walls of the preliminary groove being denoted by *a a* and the walls of the completed groove being designated *b b*. A close inspection of the finished record reveals both grooves.

The stylus which is used to make the sound-record in the preliminary groove is generally somewhat broader at the point than that which was used to form the groove in the first plate—that is to say, the point of the recording-stylus is somewhat wider than the preliminary groove. The preliminary groove seems to have the function of guiding the record-stylus and, what is more important, of lessening the work required to be done by the recording-stylus in shaping or indenting the material of the record-plate, which would otherwise have to be shaped or indented by the recording-stylus. This makes it possible to use for recording purposes the light and inexpensive gramophone reproducing-machine which is principally designed for reproducing purposes instead of being compelled to use the heavy and comparatively expensive recording-machine.

I have found the shape of the record-groove

as it finally appears in the record-tablet approximates the shape of such record-grooves as heretofore produced in accordance with the plans laid down in either of the patents above referred to, and, what seems to be quite remarkable, I have discovered that whatever difference in shape or configuration there may be between gramophone-records produced in the old way and produced in accordance with this invention such differences are not sufficient to prevent the reproduction of sound. The theoretical reasons for this I am not prepared to state. It is clear, however, from what has been said that such tablets with sound-records impressed upon a preliminary groove by a machine primarily designed for reproducing purposes may now be used for the reproduction of the sound recorded thereon by the same machine.

The method I have described for making sound-records might also be carried out by forming the preliminary spiral groove in the zinc plate as above described and thereupon superimposing a sound-record upon this preliminary groove in the zinc plate itself. A mold or patric made from such zinc plate could then be used to impress facsimiles of sound-records of the character shown in Fig. 2 upon the usual rubber record-plates.

The sound-box A and stylus B, as well as the arm C, on which they are mounted, and which are shown in Fig. 3, are of the usual construction common in the art and need no detailed description.

What I claim is—

1. A sound-recording surface carrying a plain groove and a laterally-undulating sound-record groove superimposed thereon, substantially as described.

2. The method of preparing sound-records which consists in forming a groove upon a record medium, and shaping said groove laterally in accordance with sound-vibrations, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

EMILE BERLINER.

Witnesses:

HELEN E. PARKER,
HENRY S. BERLIN.

No. 689,408.

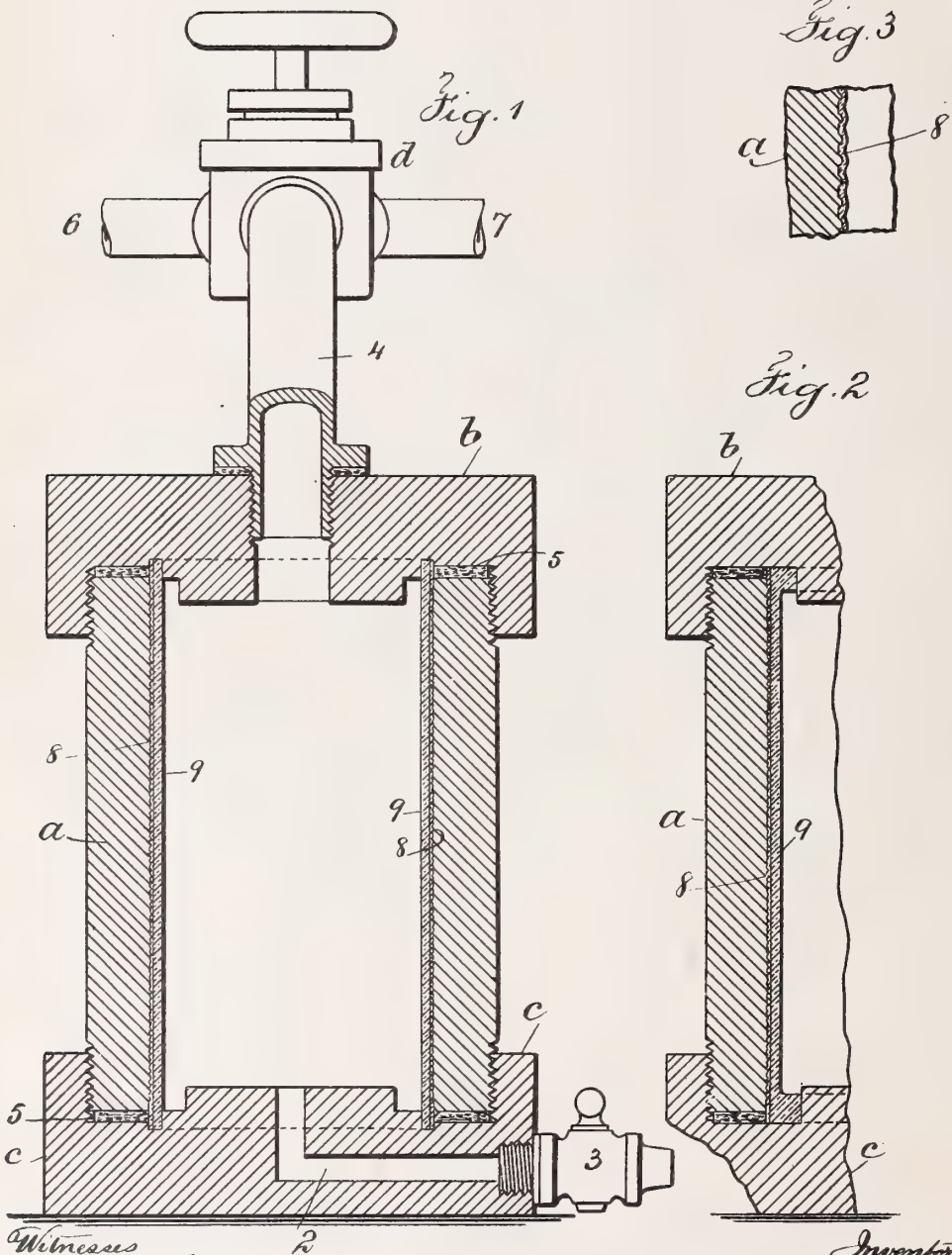
Patented Dec. 24, 1901.

A. N. PETIT.

METHOD OF MAKING SOUND RECORD CYLINDERS.

(Application filed Dec. 8, 1900.)

(No Model.)



Witnesses
Chas. H. Smith
J. Staib

Inventor
Ademore N. Petit.
Per L. W. Lereel & Son
attys

UNITED STATES PATENT OFFICE.

ADEMOR N. PETIT, OF NEWARK, NEW JERSEY, ASSIGNOR TO HIMSELF AND
ALBERT O. PETIT, OF NEWARK, NEW JERSEY.

METHOD OF MAKING SOUND-RECORD CYLINDERS.

SPECIFICATION forming part of Letters Patent No. 689,408, dated December 24, 1901.

Application filed December 8, 1900. Serial No. 39,127. (No specimens.)

To all whom it may concern:

Be it known that I, ADEMOR N. PETIT, a citizen of the United States, residing at Newark, in the county of Essex and State of New Jersey, have invented an Improvement in the Method of Making Duplicate Sound-Record Cylinders, of which the following is a specification.

Heretofore matrices have been made of original sound-records, and duplicates have been prepared from such matrices; and my present invention relates to the method of making duplicate sound-record cylinders from matrices of an original record, and the same is an improvement upon the method set forth in my application, Serial No. 25,386, filed July 31, 1900.

In carrying out my present invention I apply to the matrix-surface a material in a fluid state, preferably by a brush and centrifugal motion, and which material as the same dries and sets forms a skin or film upon the surface of the matrix, which film takes the impression of the matrix in its surface and serves for the surface of the duplicate sound-record cylinder. As a material for coating the surface of the matrix and forming the film I prefer to employ celluloid, gelatin, lac, glue, gum, collodion, or similar material, and this may be applied to any desired thickness in a fluid state. I employ a foundation or cylindrical shell fitting closely within the said film, and this foundation or shell is in whole or part of material adapted to be softened and connected by heat and pressure through adhesion to the duplicate sound-record film. I prefer that the material of the foundation or shell should be impregnated with or have a surface of the same material as that composing the film, so that connection between the two by heat and pressure may be in the form of a cementing action.

I prefer to employ an apparatus into which steam may be introduced under considerable pressure for the purpose of heating and softening the foundation or cylindrical shell and at the same time expanding the same sufficiently so as to form an intimate contact and adhesion with the film, and I propose as soon as sufficient time has elapsed to insure a con-

nection of the foundation and film in this manner to replace the steam under pressure by air under pressure and to chill the matrix, so as to cool and set the parts and thereafter to maintain the pressure of air for a sufficient time until the connected film and foundation are thoroughly set and cooled, after which the same is to be removed from the matrix.

In the drawings, Figure 1 is a vertical section of a device adapted for the carrying out of my improved method. Fig. 2 is a partial vertical section representing a modification, and Fig. 3 is a detached vertical section showing part of a connected matrix and film upon a larger scale.

The improved apparatus for carrying out the method and making the article is preferably composed of a matrix *a*, a head *b*, connected by a threaded flange to one end of the said matrix, a base *c*, connected also by a threaded flange to the other end of the said matrix in a similar manner, there being packings 5, preferably, between the ends of the matrix and the head and base, so as to insure a tight joint. The base *c* is preferably provided with an exit-opening 2 and an escape-cock 3, and the head is preferably provided with a pipe 4, and a three-way cock *d* connected to the pipe 4, and from the opposite side of which there is a steam-pipe 6 and a pipe 7 for compressed air.

8 represents the film duplicate sound-record, and 9 the foundation or cylindrical shell. I prefer to employ within the head and base annular grooves to receive the foundation ends, with the object of insuring the steam and air pressure doing the work and preventing the same getting in between the foundation and skin.

With the matrix separated and disconnected in relation to the head and base, and which matrix is formed in any manner well known in the art, the inner surface of the matrix is to be coated to any desired thickness by a material in a fluid state. This material may be applied by a brush or centrifugal motion, or both, so as to impart to the matrix-surface an even homogeneous film until the desired thickness is obtained, when the same is allowed to set or dry to yield an impression of

the matrix. The film thus obtained is firm, dense, and yet flexible, and is preferably composed of such materials as have hereinbefore been referred to.

5 The foundation 9 or cylindrical shell is adapted to fit closely within the film 8, and this foundation may be made with integral in-
turned ends or not, as this forms no necessary
10 part of the invention. I have, however, shown in Fig. 1 a foundation without inturnd ends, and in Fig. 2 a foundation with inturnd ends as the method of the present invention is
equally applicable to both forms of founda-
15 tion. This foundation is preferably made of material adapted to be softened and connect-
ed by heat and pressure through adhesion to
the duplicate sound-record film, and the ma-
terial of the foundation is preferably of such
a nature as to carry a substance of a similar
20 nature to that composing the film either by being impregnated with or by having an ap-
plied surface coating of such material, so that
the connection formed between the two by
heat and pressure may be a cementing action.
25 The material of the foundation may be and
preferably is the same as that of the film, but
loaded with pigment to give body and cheap-
ness.

After the film 8 has been made and the
30 foundation 9 inserted within the matrix the
head *b* and the base *c* are connected to the
matrix, as shown, and the escape-cock 3
closed. Steam is then admitted by the pipe
6 and the three-way cock *d* and pipe 4 into
35 the cavity or space within the matrix and
within the said foundation. The heat soft-
ens the foundation or cylindrical shell and
the pressure expands the same. The heat
also softens the film so that the surface of
40 the film and the surface of the expanding
foundation come into intimate contact and
connection and a cementing action is pro-
duced between the two, because of the sub-
stances of similar nature, by the heat and
45 pressure, so that they are connected by ad-
hesion. After sufficient time has elapsed for
this operation I prefer to close off the steam
and to replace the same by air under pres-
sure and thereafter to submerge the matrix
50 into a bath of cold water, which suddenly
chills the matrix, the film, and the founda-
tion, while the pressure is maintained within
the same. I thereafter remove the matrix
from the water or cooling mixture. In sub-
55 stituting the air under pressure for the steam
under pressure I turn the three-way cock
and admit compressed air and open the es-
cape-cock to blow out the steam. After the
steam has been blown out the escape-cock 3
60 is closed and the air-pressure maintained
within the matrix until the parts are so thor-
oughly cooled and set that it is perfectly safe
to close off the compressed air, separate the
parts, and take out the duplicate sound-rec-
65 ord cylinder complete.

If the film 8 is composed of celluloid, the

foundation 9 should either be impregnated
with a solvent of celluloid or should have an
applied surface of celluloid or a solvent ad-
hering thereto, so that the same, when soft-
70 ened with the film and forced by pressure into
connection with the materials, will join and
form a homogeneous connected or cemented
mass, and in any event, whatever material
the film may be composed of, the backing or
75 foundation should carry a substance of a
similar nature by being either impregnated
with the same or having an applied surface
coating of such material, which under heat
and pressure will combine or commingle with
80 the material of the skin so as to form a ho-
mogeneous or permanently-connected mass.

I claim as my invention—

1. The method herein specified of making
duplicate sound-record cylinders, consisting
85 in forming upon the surface of a matrix a film
of material applied thereto, inserting within
the matrix and film a foundation or cylin-
drical shell closely fitting the same and which
shell carries a substance of a similar nature
90 to that composing the film applying heat and
pressure within the foundation and matrix to
soften the material of the foundation or cy-
lindrical shell and that of the film and to
force the same into intimate contact and ad-
95 hesion, and maintaining the pressure until
the parts set and cool, substantially as set
forth.

2. The method herein specified of making
duplicate sound-record cylinders, consisting
100 in forming upon the surface of a matrix a film
of material applied thereto, inserting within
the matrix and film a foundation or cylin-
drical shell closely fitting the same and which
shell carries a substance of a similar nature
105 to that composing the film, applying heat and
pressure within the foundation and matrix to
soften the material of the foundation or cy-
lindrical shell and that of the film and to force
the same into intimate contact and adhesion,
110 and chilling the matrix and the connected
film and foundation to set and cool the parts
and maintaining the pressure during the chill-
ing and until the operations are fully com-
pleted, substantially as set forth. 115

3. The method herein specified of making
duplicate sound-record cylinders, consisting
in forming upon the surface of a matrix a film
of material applied thereto, inserting within
the matrix and film a foundation or cylin-
120 drical shell closely fitting the same and which
shell carries a substance of a similar nature
to that composing the film, applying pressure
and heat within the foundation and matrix
to soften the material of the foundation or cy-
125 lindrical shell and that of the film and to
force the same into intimate contact and ad-
hesion, displacing the material producing the
heat and pressure by air or similar fluid un-
der pressure and chilling the matrix by im-
130 mersing the same in a cooling material which
at the same time chills the connected film

and foundation, removing the same from the chilling mixture, and maintaining the pressure thereafter until the parts are thoroughly set and the finished sound-record ready for
5 removal, substantially as set forth.

4. The method herein specified of making duplicate sound-record cylinders consisting in forming upon the surface of a matrix a film of material applied thereto, placing within
10 the film a permanent base or backing, applying heat and pressure to soften the parts and force them into intimate contact and adhesion, substantially as specified.

5. The method herein specified of making
15 duplicate sound-record cylinders consisting in uniting a permanent base or backing to a film-surface and impressing a record-matrix

into said film-surface by the same pressure, substantially as specified.

6. The method herein specified of making 20 duplicate sound-record cylinders consisting in bringing a prepared film-surface into opposition to a contained and substantially contacting permanent base or backing, applying heat to soften the parts and a pressure that 25 is maintained as desired to unite the parts and insure the impressing of the film-surface by a record-matrix, substantially as specified.

Signed by me this 3d day of December, 1900.

ADEMOR N. PETIT.

Witnesses:

GEO. T. PINCKNEY,
S. T. HAVILAND.

689.536

Caps.

No. 689,536.

Patented Dec. 24, 1901.

F. L. CAPPS.

PROCESS OF MANUFACTURING CELLULOID RECORDS.

(Application filed Apr. 3, 1900.)

(No Model.)

Fig. 1

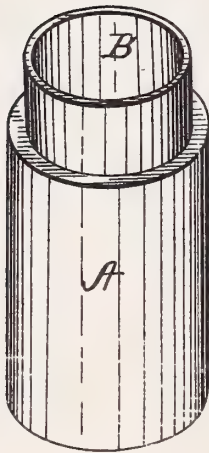


Fig. 2.

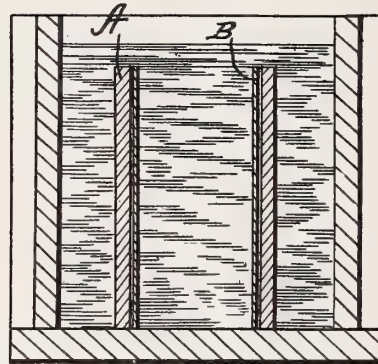
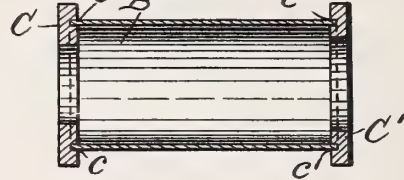


Fig. 3.



Fig. 4.



Witnesses.
W. R. Edelen.
H. B. Diefenbach.

Inventor.
Frank J. Capps
by Philip Mauro
his atty.

UNITED STATES PATENT OFFICE.

FRANK L. CAPPS, OF NEWARK, NEW JERSEY, ASSIGNOR TO THE AMERICAN GRAPHOPHONE COMPANY, A CORPORATION OF WEST VIRGINIA.

PROCESS OF MANUFACTURING CELLULOID RECORDS.

SPECIFICATION forming part of Letters Patent No. 689,536, dated December 24, 1901.

Application filed April 3, 1900. Serial No. 11,357. (No specimens.)

To all whom it may concern:

Be it known that I, FRANK L. CAPPS, of Newark, New Jersey, have invented a new and useful Improvement in Processes of Manufacturing Celluloid Records, which invention is fully set forth in the following specification.

This invention relates to sound-records, and particularly to an improvement in the production of copies of sound-records (or duplicates) in celluloid by the pressing or molding process.

The invention is based upon the fact that celluloid expands considerably when softened by the admixture or the application of a solvent. It is not limited to any particular shape of record, as the latter may be a cylinder or a disk, nor is it limited to the kind of record, which may consist of vertical irregularities characteristic of graphophone-records or of lateral undulations characteristic of the type known as "gramophone-records." For the sake of clearness I will describe my invention as applied to cylindrical graphophone-records.

I avail myself of the property of celluloid above referred to, as follows: First I take a cylindrical matrix that contains upon its inner face a cast or copy in reverse of the original sound-record. This matrix may be formed in any approved manner, as by casting or by depositing upon the surface of the original record a film or coating of chromitized gelatin. This step forms no part of my present invention, being fully set forth in certain pending applications of my own. Next I take a celluloid cylinder and insert it into the matrix. Then I dip the two cylinders into a solvent of celluloid, such as alcohol or the commercial "celluloid-thinner," but preferably amyl acetate, and hold them there for a short while until the surface of the celluloid has become softened. Then I remove them from the bath and set them to dry, taking care all the while that there is no slip between the two cylinders. When the celluloid cylinder is softened by the solvent, it expands, as stated, and resumes its normal condition only by the evaporation of the solvent; but the solvent can evaporate only from the interior surface of the celluloid cylinder and not from its outer surface, which is now tightly clamped against

the surrounding matrix-surface. In consequence the whole interior surface (where the evaporation takes place) shrinks back radially from the center toward the matrix, drawing back and contracting the whole (radial) thickness of the cylinder-wall. Moreover, as each particle of the solvent from the outer surface of the celluloid cylinder (which is held closely against the matrix-surface, as noted) and each particle throughout the mass of the same passes out its place has to be taken by an equivalent particle of celluloid. The result of all this is to pack the celluloid material closely against the matrix-surface, so that when the celluloid has resumed its normal condition the cylinder is of slightly-larger diameter both external and internal than originally. This means that after hardening and becoming set the celluloid cylinder is still pressing firmly against the matrix, its temporarily-softened surface having been pressed into the minute irregularities of the matrix-surface. When the celluloid is thoroughly dried, it is separated from the matrix, as by breaking off the latter or by in any manner shrinking the former or by collapsing and then withdrawing the former. This celluloid cylinder will be found to contain upon its outer surface a faithful copy of the original sound-record. It may be backed up by any suitable mounting. A simple and inexpensive mounting consists of two rings of suitable material—metal, wood, celluloid, &c.—each having an annular groove into which the adjacent end of the celluloid shell or cylinder is fitted and cemented or otherwise secured. The inner diameters of the respective rings are proportioned to fit upon the tapering mandrel of an ordinary reproducing-machine.

In case the original record be a flat one (disk) of course the matrix will be of the same shape and a flat sheet of celluloid will be employed; but the process and the results will be the same. The temporarily-softened celluloid will shrink back against the matrix-surface, being held there by atmospheric pressure, as before, and when removed will be found to contain a faithful copy of the original record.

In the drawings illustrating my invention, Figure 1 shows a celluloid cylinder B being

inserted into a matrix A. Fig. 2 is a sectional view representing the two cylinders in a solvent-bath. Fig. 3 shows the two set to dry; and Fig. 4 is a sectional view showing the record B mounted in supporting-rings C C', the ends of the shell B being cemented in the annular grooves *c c'*.

Having thus described my invention, I claim—

10 1. The herein-described process of molding sound-records in celluloid, which consists of softening a celluloid tablet by the application of a solvent and then forcing the same against a suitable matrix by its own expansive force, substantially as described.

15 2. The process of molding a record of sound into or upon a celluloid cylinder, which consists in first inserting the celluloid cylinder into a suitable matrix, next applying a sol-

vent to the celluloid, then allowing the celluloid to dry, and finally separating the celluloid cylinder from the matrix, substantially as described.

3. The process of molding a record of sound into or upon a celluloid cylinder, which consists in first inserting the celluloid cylinder into a suitable matrix, next dipping the two into a solvent-bath, then removing them and allowing the celluloid to dry, and finally separating the celluloid cylinder from the matrix, substantially as described.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

FRANK L. CAPPS.

Witnesses:

V. H. EMERSON,
C. A. L. MASSIE.



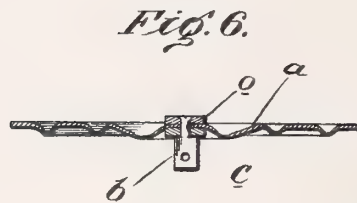
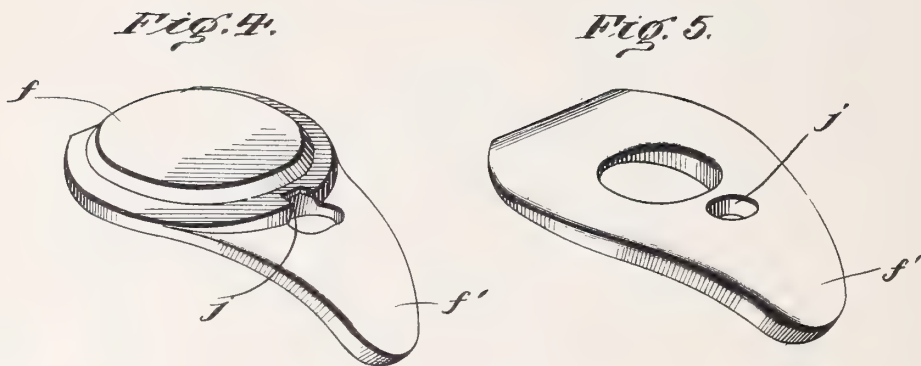
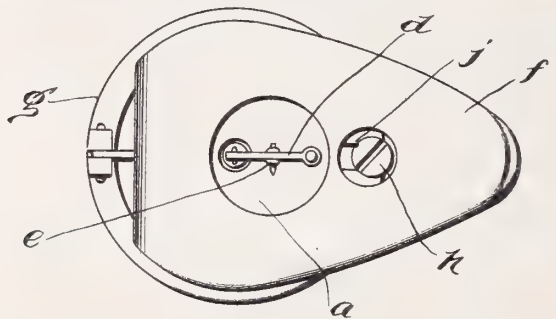
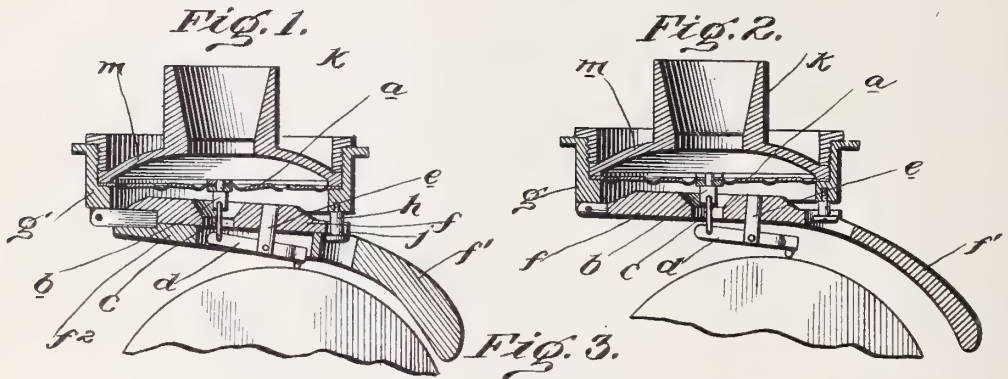
No. 690,069.

Patented Dec. 31, 1901.

E. H. MOBLEY.
PHONOGRAPH REPRODUCER.

(Application filed July 3, 1901.)

(No Model.)



Witnesses;
Fred J. Hattman.
R. M. Kelly.

Inventor
Eadwe N. Mobley
By his atty *Wm. B. Smith*

UNITED STATES PATENT OFFICE.

EDWIN H. MOBLEY, OF PHILADELPHIA, PENNSYLVANIA.

PHONOGRAPH-REPRODUCER.

SPECIFICATION forming part of Letters Patent No. 690,069, dated December 31, 1901.

Application filed July 3, 1901. Serial No. 66,942. (No model.)

To all whom it may concern:

Be it known that I, EDWIN H. MOBLEY, of the city and county of Philadelphia, in the State of Pennsylvania, have invented an Improvement in Phonograph-Reproducers, of which the following is a specification.

My invention relates to phonograph-reproducers; and it consists of the improvements which are set forth in the following specification and are shown in the accompanying drawings.

The unsatisfactory results obtained from phonograph-reproducers as now constructed are to a large extent due to the fact that the stylus or reproducer point is not held with sufficient pressure upon the surface of the cylinder to accurately follow the grooves therein. It is usual to employ a plate hinged at one side to the ring of the reproducer and carrying the fulcrum of the stylus-operating lever; but heretofore it has not been practical to impart sufficient weight to this pressure-plate without unduly increasing its thickness and the distance between the diaphragm and the surface of the cylinder.

It is one of the objects of my invention to overcome this difficulty by increasing the downward pressure of the stylus without necessarily increasing, but even when desired decreasing, the thickness of the plate between the diaphragm and cylinder, so that a maximum tension may be obtained with a minimum thickness of plate and without interfering with the freedom of movement of the stylus in following the irregularities of the grooved surface of the record-cylinder. This object I accomplish by providing the plate which carries the stylus-lever with a leverage extension projecting laterally beyond the reproducer-ring. This may be made either in a single unitary piece with the plate or as a separate piece adapted to be attached to the plate as now commonly employed. This leverage extension may be made of any length and thickness to suit the requirements.

In the drawings, Figure 1 is a transverse sectional view of a phonograph-reproducer embodying my improvements. Fig. 2 is a similar view illustrating a modification. Fig. 3 is an inverted plan view of the reproducer. Figs. 4 and 5 are respectively perspective and inverted perspective views of the controlling-

weight of the form shown in Fig. 2, and Fig. 6 is a transverse sectional view of the diaphragm.

a is the diaphragm, to which is secured the shank *b*, connected by the link *c* with the stylus-lever *d*, which is pivoted to a lug or post *e*, carried by the hinged controlling-weight *f*. The weight *f* is hinged at one side to the ring *g*, and the free end is supported loosely by a pin *h* engaging a slot or notch. This construction is well known and commonly used; but as at present constructed the controlling-weight *f* to impart the desired pressure to the stylus must be made of considerable thickness.

To enable a greater pressure to be obtained without the necessity of unduly increasing the thickness of the controlling-weight, I form the weight with a lateral extension *f'* beyond the fulcrum-post *e*, which not only enables more weight to be employed, but increases the leverage through which the weight acts, so that an effective downward pressure is obtained without unduly increasing the thickness of the body of the weight adjacent to the stylus. The downward movement of the weight *f* is usually controlled and limited by a screw or pin *h* on the ring *g* engaging a notch or aperture *j* in the weight, and the extension *f'* is preferably formed beyond this point extending outwardly and curving over the record-cylinder. This extension may be thickened or weighted at its extremity to any extent desired to increase the weight and downward pressure. The weight with this leverage extension is preferably constructed in a single unitary piece, as shown in Figs. 2, 4, and 5; but in some cases where the reproducer is already provided with the ordinary weight, such as is now used, the leverage-extension weight may be made as a separate piece *f''* and applied to the ordinary weight, as shown in Fig. 1.

k is the tube of the reproducer through which the vibrations are transmitted. Instead of forming the mouth of the tube with flat walls, as is customary, I arch them so as to form a dome-shaped mouth *m*, as shown, which not only increases the air-space behind the diaphragm, but materially aids in the transmission of the sound-waves.

Owing to the liability of the post *b* becoming

ing loosened or detached from the diaphragm
a if cemented thereto, as is customary, I pre-
fer to rivet it to the diaphragm, as shown in
Fig. 6. The diaphragm is clamped between

5 washers *o o*, in which the post *b* is riveted.

What I claim as new, and desire to secure
by Letters Patent, is as follows:

1. In a phonograph-reproducer, the combi-
nation with the reproducer-head and the sty-
lus-operating lever, of a hinged plate or frame
carrying said stylus-operating lever, and pro-
10 vided with a leverage extension *f'* projecting
laterally beyond the reproducer-head.

2. In a phonograph-reproducer, the combi-
15 nation with the reproducer-head and the sty-
lus-operating lever, of a hinged plate or frame
carrying said stylus-operating lever, and pro-
vided with a leverage extension *f'* projecting
laterally beyond the reproducer-head and
20 having a thickened or weighted extremity.

3. In a phonograph-reproducer, the combi-
nation with the reproducer-head and the sty-
lus-operating lever, of a hinged plate or frame
carrying said stylus-operating lever, and pro-
25 vided with a curved leverage extension *f'*

projecting laterally beyond the reproducer-
head.

4. The stylus-controlling weight for phono-
graph-reproducers consisting of a plate adapt-
ed to carry the stylus-operating lever and pro-
30 vided with a leverage extension *f'*, substan-
tially as described.

5. The stylus-controlling weight for phono-
graph-reproducers consisting of a plate adapt-
ed to carry the stylus-operating lever and pro-
35 vided with a curved leverage extension *f'*,
substantially as described.

6. The stylus-controlling weight for phono-
graph-reproducers consisting of a plate adapt-
ed to carry the stylus-operating lever and pro-
40 vided with a curved leverage extension *f'*,
having a thickened or weighted extremity,
substantially as described.

In testimony of which invention I have
hereunto set my hand.

EDWIN H. MOBLEY.

Witnesses:

THOS. MARTIN SMITH,
R. M. KELLY.



No. 690,368.

Patented Dec. 31, 1901.

C. J. KINTNER.
SOUND REPRODUCING DEVICE.

(Application filed Jan. 21, 1898.)

(No Model.)

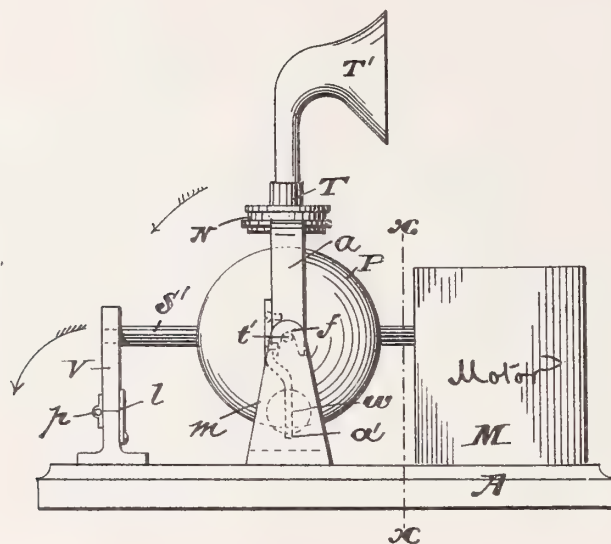


Fig. 1.

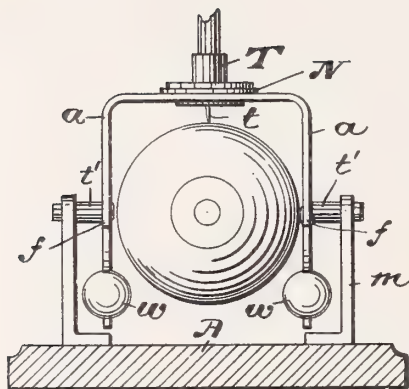


Fig. 2.

WITNESSES:

Henry Krug
W. F. Keating

INVENTOR

Charles J. Kintner

UNITED STATES PATENT OFFICE.

CHARLES J. KINTNER, OF NEW YORK, N. Y.

SOUND-REPRODUCING DEVICE.

SPECIFICATION forming part of Letters Patent No. 690,368, dated December 31, 1901.

Application filed January 21, 1898. Serial No. 667,466. (No model.)

To all whom it may concern:

Be it known that I, CHARLES J. KINTNER, a citizen of the United States, residing at New York, in the county of New York and State of New York, have made a new and useful invention in Sound-Reproducing Devices, of which the following is a specification.

My invention is directed particularly to a novel sound-reproducing device; and to this end it consists in constructing a record-blank of spherical form and combining therewith means for rotating the record and advancing the stylus thereover.

For a full and clear understanding of the invention, such as will enable others skilled in the art to construct and use the same, reference is had to the accompanying drawings, in which—

Figure 1 is a side elevational view of my invention complete, and Fig. 2 is a sectional view taken through Fig. 1 on the lines *xx* and as seen looking thereat from right to left.

A is the base, M the motor-box, and S' the shaft connected to the motor and supporting the phonogram-blank, constructed, preferably, of wax and in the form of a sphere P. The outer end of the shaft is journaled in a standard V, pivotally secured to the base A at *p* and provided with a lock or latch *l* for locking it in its upper position.

m and *m* are vertical standards provided at their upper ends with inwardly-extending trunnions *t' t'*.

a a are the arms of a yoke to the upper surface of which is secured the diaphragm-supporting chamber N, *t* being the stylus, T the sound-conveying tube, and T' the trumpet.

w w are counterweights secured by screw-threads to the lower ends of the arms *a a*, and *ff* are pivot-bearings adapted to support the arms *a a* upon the trunnions *t' t'*.

The operation of the apparatus is as follows: The standard V is unlocked and tilted to the left in the direction of the lower arrow and the record or phonogram blank P placed in position upon the conical mandrel. (Shown in dotted lines.) The standard V is then restored to its normal position and locked by the latch *l*. The diaphragm-chamber N and its attached parts, consisting of the dia-

phragm, (not shown,) and the stylus *t*, and sound-conveying tube T, and trumpet T', are then secured to the arms *a a* and the latter hung upon the trunnions *t' t'* in the extreme right-hand position, or so that the mouth of the trumpet is near the top of the motor-box, with the counterweights *w w* extending outward to the left. After the proper adjustment is attained between the stylus *t* and the record the motor is set in motion and the spiral-like nature of the record causes the parts to advance in the direction of the upper arrow, thereby correctly reproducing the sounds in a manner well understood, the stylus *t* traveling always in a great circle of the spherical record and bearing, therefore, a constant relation to the record.

I do not limit my invention to the special detail of construction hereinbefore described, and illustrated in the accompanying drawings, as I believe I am broadly entitled to claim a phonographic record of spherical form, and my claims are generic as to this feature and also to a record of spherical form with means for rotating the same.

Having thus described my invention, what I claim, and desire to secure by Letters Patent of the United States, is—

1. The improved record-blank for talking-machines comprising a record-blank having a spherical surface.

2. The combination with a stylus in a sound-reproducing machine of a rotary spherical record and means for causing the stylus to traverse the spherical surface of the record.

3. A phonograph or sound-reproducing device having a spherical-shaped record provided with means for rotating it about one axis of the sphere, in combination with a reproducing-stylus pivotally supported substantially at right angles to the axis of rotation, whereby the stylus is adapted to travel in the arc of a great circle on said spherical record.

4. A phonograph or sound-reproducing device provided with a spherical-shaped record, in combination with reproducing means so supported in connection with said record as to travel in the arc of a great circle thereof.

5. A phonograph or sound-reproducing device having a spherical-shaped record and

means for rotating the same, in combination
with reproducing means so supported with
relation to the surface of the record that the
stylus thereof will travel in a great circle
5 thereof, passing through the plane of its axis.
of rotation.

In testimony whereof I have hereunto sub-

scribed my name this 20th day of January,
1898.

CHARLES J. KINTNER.

Witnesses:

M. M. ROBINSON,
A. T. COONEY.



No. 690,858.

Patented Jan. 7, 1902.

J. W. HENDERSON.
HORN FOR PHONOGRAPHS OR GRAPHOPHONES.

(Application filed May 11, 1901.)

(No Model.)

Fig. 1.

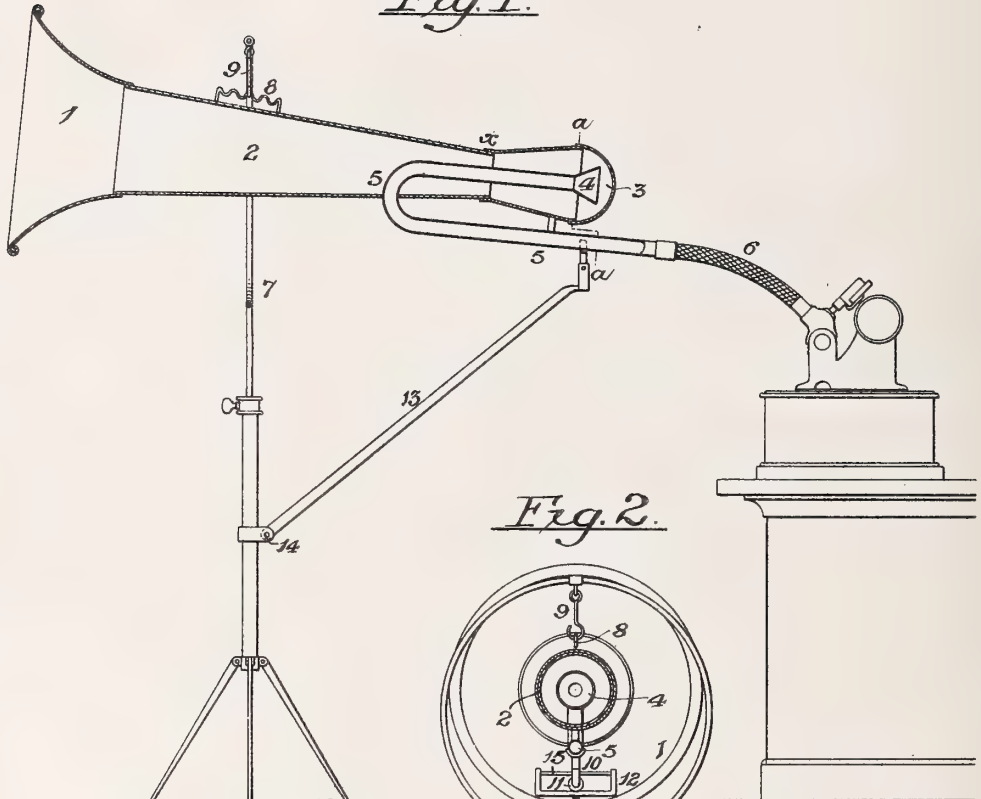


Fig. 2.

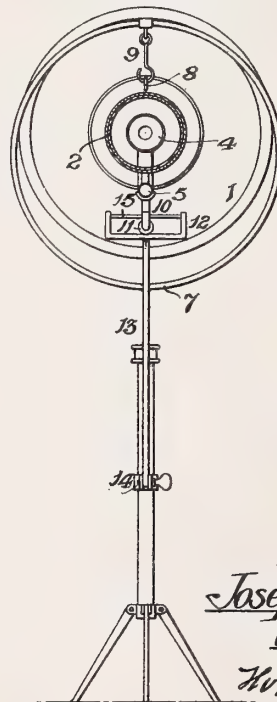
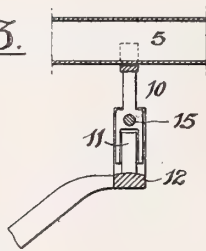


Fig. 3.



Witnesses:

Charles C. Clough
Hamilton D. Turner

Inventor:

Joseph W. Henderson
by his Attorneys,
Howman & Howman

UNITED STATES PATENT OFFICE.

JOSEPH W. HENDERSON, OF PHILADELPHIA, PENNSYLVANIA.

HORN FOR PHONOGRAPHS OR GRAPHOPHONES.

SPECIFICATION forming part of Letters Patent No. 690,858, dated January 7, 1902.

Application filed May 11, 1901. Serial No. 59,838. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH W. HENDERSON, a citizen of the United States, residing in Philadelphia, Pennsylvania, have invented certain Improvements in Horns for Phonographs or Graphophones, of which the following is a specification.

My invention relates to sound-amplifying horns for use in connection with phonographs, graphophones, and other machines of a similar character.

The improved horn forming the subject of my invention has a flaring bell-mouth at one end and a rounded cap at the opposite end with tapered portions leading from said ends and joined together near the rounded end, whereby the internal diameter of the horn is contracted, and having an opening for the passage of sound near the contracted portion.

My improved horn is adapted to receive as well as transmit sound, and is especially designed to record and reproduce the human voice. By its use I am enabled to dissipate and remove to a large extent the objectionable metallic tones usually present when records of the human voice are reproduced and to improve the delivery of such tones, simulating to a great extent the natural tones of different sounds, especially the tones of the human voice.

My invention also includes a special mounting for the horn, so that it may readily move with the recording or reproducing instrument.

My invention is fully illustrated in the accompanying drawings, in which—

Figure 1 is a sectional elevation of a horn made in accordance with my invention, showing the same connected to the recording or reproducing diaphragm of an ordinary phonograph or graphophone. Fig. 2 illustrates a cross-sectional view of the horn, taken on the line *a a*, Fig. 1, showing also the stand and special mounting for the horn; and Fig. 3 is a sectional view illustrating a detail of the invention.

A horn made in accordance with my invention may be used with equal success either for recording or reproducing sound. When reproducing records of the human voice as usually made, particularly records of the soprano or tenor notes of singers, such notes are

delivered in sharp metallic tones. This defect is well recognized in the use of phonographs and graphophones, and these tones are particularly objectionable when the voice produced is that of a woman. With the improved horn made in accordance with my invention I can soften the tones produced from a record made with an ordinary horn or in any usual manner, or I can make with the aid of my improved horn a record that may be reproduced with better effect than ordinary records.

In the drawings herewith a horn is shown having the usual bell-mouth 1 and a body 2, which tapers rearwardly to the point *x* and is then enlarged in the form of a rounded end 3, which forms the rear end of the horn and performs the function of a sounding-board. The horn is contracted at the point *x* for two purposes—first, to prevent the escape of the sound received by the horn and thrown against the concave rear end of the same for delivery to the diaphragm when recording, and, second, to modulate the sound discharged by the bent tube leading from the diaphragm against said concave end of the horn when reproducing.

The horn may be made of several pieces, as clearly shown in the drawings, such construction being cheaper. It may, however, be constructed of two pieces—namely, the bell-mouth and body and the rounded rear end—such pieces to be joined at *x*, and such joint may be lapped, as shown, or smooth on the inside and covered by a ring of metal on the outside.

When reproducing instead of delivering the sound produced by the diaphragm directly at the rear end of the horn, as is usually done, I deliver such sounds against the inner surface of the semicircular rear end 3 of the horn from the flaring end 4 of the U-shaped pipe or tube 5. This pipe is arranged within and without the horn, as shown, the connection with the horn being at the bend, and the outer end is connected to the diaphragm of the machine by means of a flexible tube 6. The flexible tube which I prefer to use is one having a wall of coiled-wire spring inclosed in a braided cover. This structure may or may not be combined with a rubber tube.

The horn is suspended in the usual manner from a stand 7, a notched member 8 being carried by the horn, by which it is suspended from a link 9, such arrangement being the usual way of disposing the horn in the desired position.

In order to provide for the positive movement of the rear end of the horn as the reproducing or recording instrument travels along the record, I provide a hanging yoke-support 10, preferably carried by the tube 5, said support having a roller 11, which is adapted to a bracket 12, supported by the stand 7. This bracket is carried by a rod 13, pivoted to the stand at 14, and connection is made with the yoke-support 10 by means of a pin 15, which is carried by the bracket 12 and passes through said yoke-support. This construction permits the easy and positive movement of the horn in unison with the recording or reproducing member of the machine and insures the proper contact of such instrument with the record.

Having thus described my invention, I claim and desire to secure by Letters Patent—

1. A sound-amplifying horn having a flaring bell-mouth at its larger end, and a rounded cap at its smaller end, said members having tapering portions joined together near the rounded-cap end, thereby contracting the internal diameter of the horn at a point in advance of the rounded-cap end, and a connection between said horn and the diaphragm of a sound recording and reproducing machine, said connection having its open end within the horn adjacent to the rounded-cap portion of the same.

2. The combination with a machine for recording and reproducing sound, of an amplifying-horn having a bell-mouth at its larger end, and a rounded cap at its smaller end, said members having tapered portions joined together near the rounded-cap end thereby contracting the internal diameter of the horn at a point in advance of the rounded-cap end, a diaphragm carried by said machine, a tube carried by the horn having a portion within the latter terminating adjacent to the rounded-cap end, and a portion outside said horn suitably supported, and means for connecting said tube with the diaphragm.

3. The combination with a machine for re-

cording and reproducing sound, of an amplifying-horn comprising a conical body portion having a flaring bell-mouth at its larger end and a rounded conical cap closing the opposite end, the point of junction between the body portion of the horn and the cap being of less diameter than the rounded end of the cap, a diaphragm carried by said machine, a bent tube carried by the horn and affording communication between the same and said diaphragm, said tube entering the horn at a point in advance of the connection with the cap and having its open end extending into said cap, the portion of said tube outside the horn being secured to a flexible connection leading to the diaphragm, substantially as and for the purpose set forth.

4. The combination with a machine for recording and reproducing sound, of an amplifying-horn having a flaring bell-mouth at its larger end, and a rounded cap at its smaller end, said members having tapered portions joined together near the rounded-cap end, thereby contracting the internal diameter of the horn at a point in advance of the rounded-cap end, a diaphragm carried by said machine, a bent tube carried by the horn and having a portion within the latter terminating adjacent to the rounded-cap end in a bell-mouth, and a portion outside said horn suitably supported, and a flexible connection between the end of the outer portion of the bent tube and the diaphragm, whereby the movement of the latter will not be affected by the movement of the horn, substantially as described.

5. The combination with a machine for recording and reproducing sound, of a sound-amplifying horn, a support for said horn, a bent tube forming the connection between the machine and the horn, a trolley or roller carried by said tube, an adjustable arm carried by the support for the horn, and a track carried by said arm to which said wheel or trolley is adapted.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JOSEPH W. HENDERSON.

Witnesses:

MURRAY C. BOYER,
JOS. H. KLEIN.



No. 691,000.

Patented Jan. 14, 1902.

A. B. ROBINSON.
PHONOGRAPH APPARATUS.

(Application filed Jan. 14, 1901.)

(No Model.)

2 Sheets—Sheet 1.

Fig. 1.

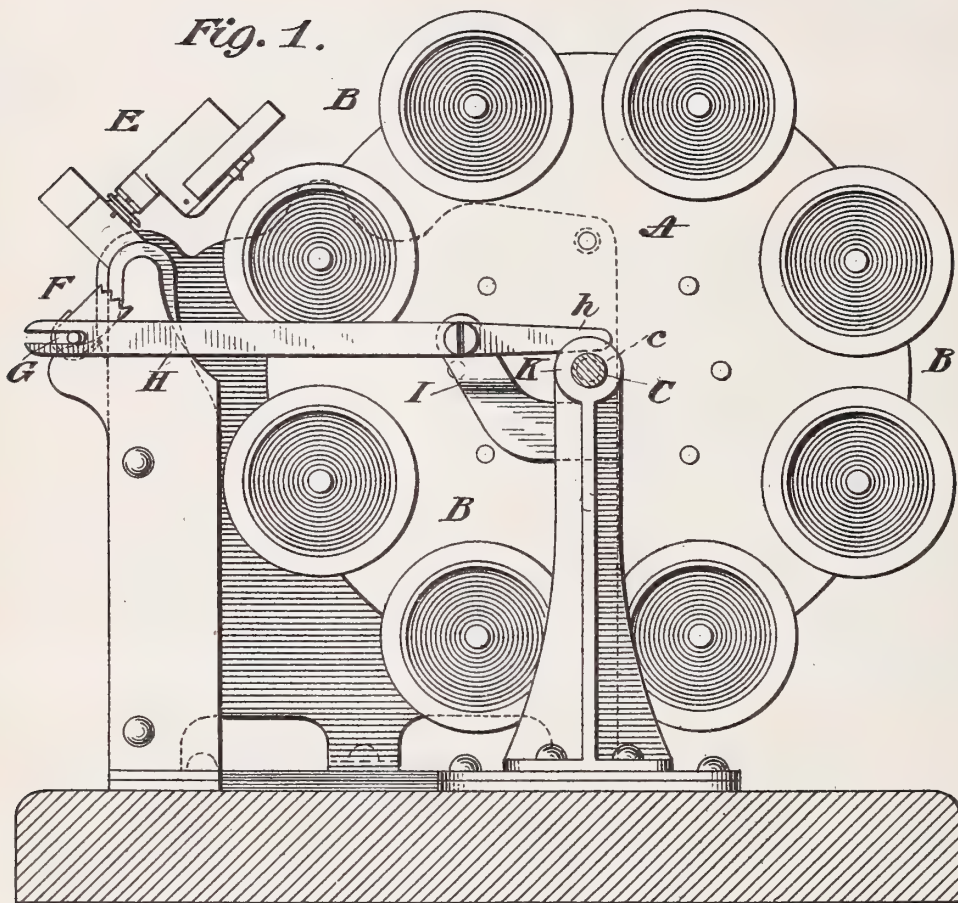


Fig. 2.

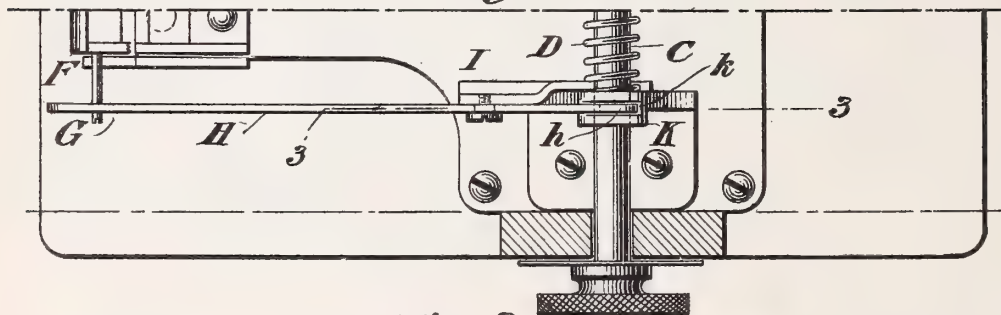
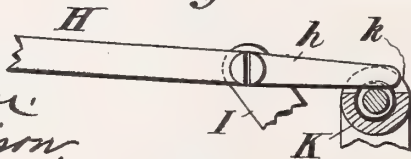


Fig. 3.

WITNESSES:

Frank S. Ober,
Wm. Harrison.



INVENTOR

Arthur B. Robinson

BY

Baldwin, Davidson & Co.

ATTORNEYS

No. 691,000.

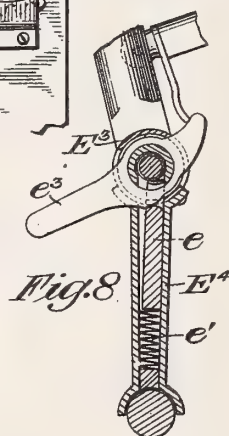
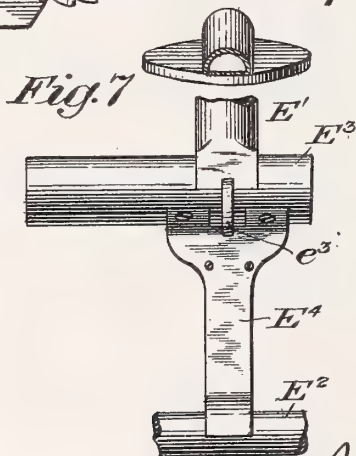
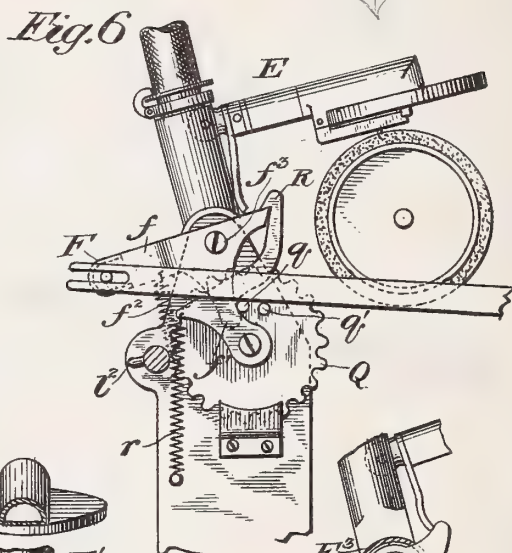
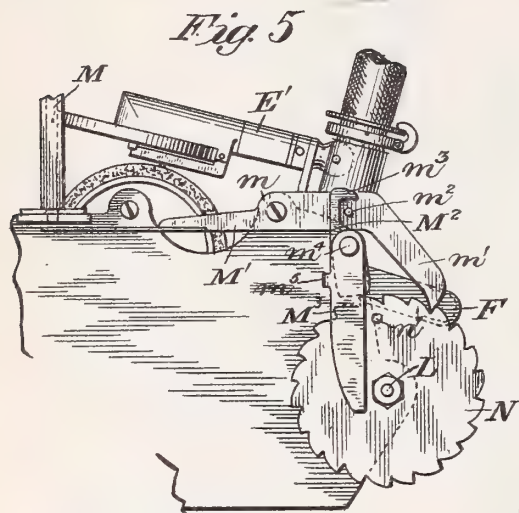
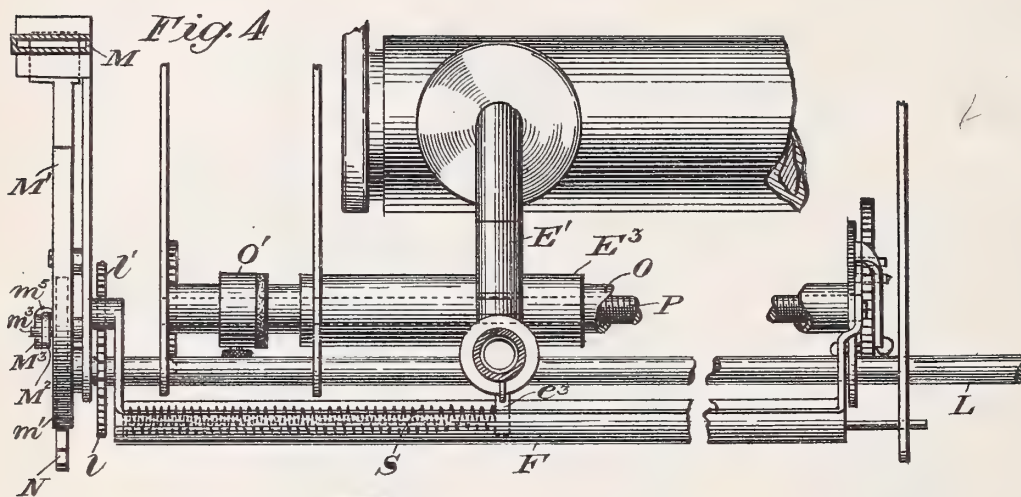
Patented Jan. 14, 1902.

A. B. ROBINSON.
PHONOGRAPH APPARATUS.

(Application filed Jan. 14, 1901.)

(No Model.)

2 Sheets—Sheet 2.



Witnesses
J. B. Baldwin
L. J. Browning

Inventor
Arthur B. Robinson
By his Attorneys
Baldwin, Davidson & Wright

UNITED STATES PATENT OFFICE.

ARTHUR B. ROBINSON, OF DICKINSON, NORTH DAKOTA.

PHONOGRAPH APPARATUS.

SPECIFICATION forming part of Letters Patent No. 691,000, dated January 14, 1902.

Application filed January 14, 1901. Serial No. 43,200. No model.

To all whom it may concern:

Be it known that I, ARTHUR B. ROBINSON, a citizen of the United States, residing at Dickinson, in the county of Stark, State of North Dakota, have invented certain new and useful Improvements in Phonograph Apparatus, of which the following is a specification.

The invention relates particularly to coin-controlled multiple-record apparatus, which may be of the general character shown in my Patent No. 634,025, dated October 3, 1899, or of other types to which this invention is applicable either in the special form herein disclosed or in other forms capable of producing like results and which may no doubt be readily devised by those skilled in such matters without departing from the principles of my invention. The general purpose of the invention is to prevent the movement of the reproducer into working position until a record has been properly placed in coöperative relation to it and to prevent the record while the reproducer is in action from being moved or shifted.

In the accompanying drawings I have indicated an apparatus like or the same as that disclosed in my patent above mentioned.

Figure 1 is a vertical section on the line 1 1 of Fig. 2; Fig. 2, a plan view of one side of the machine with one of the side plates or standards of the frame in section, and Fig. 3 a detail sectional view on the line 3 3 of Fig. 2; Fig. 4, a detail plan view showing the reproducer and its actuating and controlling mechanism; Fig. 5, an elevation of the left-hand end thereof; Fig. 6, an elevation of right-hand end; Fig. 7, a detail elevation, partly broken away, indicating the reproducer and some associated parts; and Fig. 8, a detail section in the line 8 8 of Fig. 4.

A is the disk carrying the multiple records B, and C its shaft, to which the spring D is applied, the organization being such that the shaft may be drawn outwardly and it and the disk rotated to bring either of the records into coöperative relation to the reproducer, all as fully disclosed in my patent.

E is the ordinary rising-and-falling or rocking reproducer, and F the ordinary rocking "shipping-trough," controlling the up-and-down position of the reproducer.

In apparatus of this kind there is danger

of the reproducer being thrown forward at a time when a record is not in position to receive it, a condition liable to result, by reason of the subsequent rotation of the reel or group of records, in injury to both the reproducer and one or both of two adjoining records. There is also liability of injury both to the reproducer and records should the shaft be manipulated in an attempt to turn up a new or adjoining record while the reproducer is in operative contact with another one. Broadly speaking, the invention consists in means for preventing the occurrence of either of these conditions. Such means or mechanism may of course be embodied in various forms. That which experience has demonstrated to be a suitable, practical, and efficient one is shown in the drawings and is as follows: Coupled to the ordinary shipping-trough, which rises as the reproducer descends, and vice versa, by a pin-and-slot connection G, is a lever H, pivoted in rear of such connection, as in a bracket I, and whose rear end extends over the shaft C. In the shaft is an annular groove c, with which the end of the lever engages. When the shaft C is in its normal position, the lever enters the slot as the reproducer moves into operative relation to a record B and locks the shaft against end-wise movement. Should the shaft not be in normal position when the reproducer is moved forward, the end of the lever abuts against an ungrooved part of the shaft and arrests the forward movement of the reproducer. In the construction shown the bearing-box K of the shaft is slotted at k, and the end of the lever is guided in the slot. When the shaft is in normal position, the annular groove therein is opposite the slot. A usual construction of apparatus of this general character is shown in Figs. 4 to 8.

L is the winding-shaft, on which is secured the gear l, which meshes with the gear l' of the usual spring or weight motor.

M is the coin-chute, and M' M² M³ the levers or latches associated therewith and with the ratchet-wheel N and which permit the operation of the winding-shaft.

The reproducer support or carriage E' is mounted on the sleeve E³ and guided below by the part E⁴ on the shaft E². The sleeve E³ slides on the longitudinally-slotted sleeve

O, which incloses the usual screw feed-shaft P. The lower part E^4 of the reproducer carriage or support is of hollow construction and contains the feed-block e , which is engaged by the spring e' and actuated by the cam-piece e^3 . This mechanism is of usual construction and is clearly shown in cross-section in Fig. 8.

Mounted on a stud-bearing on the right-hand upright of the machine is the toothed wheel Q, which is so located that a pin l^2 on the winding-shaft can engage with its teeth. On the wheel Q are two pins q and q' , which engage with the latch R and with a lug f' on the end f of the shipping-trough F. This trough is normally drawn down by the spring f^2 and held by a latch R, controlled by the spring r . The trough F is pivoted to the end frame by screw f^3 . In the trough is a spring S, which returns the reproducer and its connected parts to their normal position at the left-hand side of the machine after a composition has been rendered.

At the left-hand side of the machine are located the above-mentioned latches or levers M' , M^2 , M^3 and the ratchet-wheel N. The lever M' is pivoted at m and has a pawl end m' , adapted to engage the ratchet-wheel N, and having a pin m^2 , that is partially encircled by a lug m^3 on the upper portion of the lever M^2 , pivoted at m^4 . Also pivoted at m^4 is the lever M^3 , which has a projecting lug m^5 , adapted to work against the edge of the free end of the part M^2 .

The operation is as follows: When a coin is deposited in the coin-slot M, it depresses the lever M' and disengages its pawl end m' from the ratchet-wheel N. The coin, however, is not allowed to drop past the lever M' , as the pin m^2 on the lever is prevented from continuing its upward movement by the lug m^3 on the latch M^2 . The winding-shaft can now be revolved in the direction indicated by the arrows in Figs. 5 and 6. The wheel Q is revolved by the pin l^2 on the winding-shaft engaging with its teeth until the pin q , mounted thereon, engages the lug f' and raises the trough F, that carries with it the cam-piece e^3 , which permits the feed-block E^4 to engage the screw feed-shaft P, and also permits the reproducer-carriage to drop the reproducer upon the record. The screw feed-shaft P engaging the feed-block causes the reproducer to feed across the record against the tension of the spring S. During the reproduction of the record the winding-shaft revolves in an opposite direction to that shown by the arrow and carries around tooth by tooth wheel Q in a direction opposite to that indicated by the arrow thereon. On the first revolution of the winding-shaft now occurring the pin n' on the ratchet-wheel N will contact with the lever

M^3 and move it until the lug m^5 has carried the latch M^2 to such position that its lug m^3 has passed out of the way of the pin m^2 , thus permitting the coin to carry the lever M' down and fall into a receiving-box, (not shown,) when the lever M' will return to its normal position. The winding-shaft continues to revolve until the pin q' on the wheel Q contacts with and disengages the latch R from the trough end f , at which time the spring f^2 will return the trough to its normal position. The trough F will carry with it the cam-piece e^3 , which first raises the reproducer and then disengages the feed-block from the screw-shaft. The spring S now pulls the reproducer and its associated parts to their normal position at the left of the machine. An adjustable stop and buffer O' is provided to lessen the blow of impact.

I claim as my invention—

1. In a multiple-record phonograph apparatus, the combination with the multiple-record carrier, reproducer and screw feed-shaft with which the reproducer is engaged when lowered and disengaged from when raised, of a locking mechanism operated by the raising of the reproducer to lock the multiple carrier when in a normal position against manipulation.

2. In a multiple-record phonograph apparatus, the combination with the multiple-record carrier, reproducer and screw feed-shaft with which the reproducer is engaged when lowered and disengaged from when raised, of a locking mechanism controlled by the up-and-down movement of the reproducer, and acting either to prevent the descent of the reproducer if the carrier is not in a normal position, or on the descent of the reproducer to lock the carrier if it is in a normal position.

3. In a multiple-record phonograph apparatus, the combination of the multiple-record carrier having an endwise-movable annularly-grooved shaft, the rocking reproducer, the screw feed-shaft with which it is engaged when lowered and from which it is disengaged when raised, the rocking trough controlling the position of the reproducer, and a locking-lever actuated by the trough to either enter the groove and lock the carrier if in a normal position when the reproducer descends, or to abut against the shaft and prevent the descent of the reproducer if the carrier is not in a normal position.

In testimony whereof I have hereunto subscribed my name.

ARTHUR B. ROBINSON.

Witnesses:

EDWARD C. DAVIDSON,
KATHARINE MACMAHON.

No. 692,337.

Patented Feb. 4, 1902.

A. N. PETIT.

APPARATUS FOR MANUFACTURING DUPLICATE SOUND RECORD CYLINDERS
FOR PHONOGRAPHS.

(Application filed Mar. 18 1901.)

(No Model.)

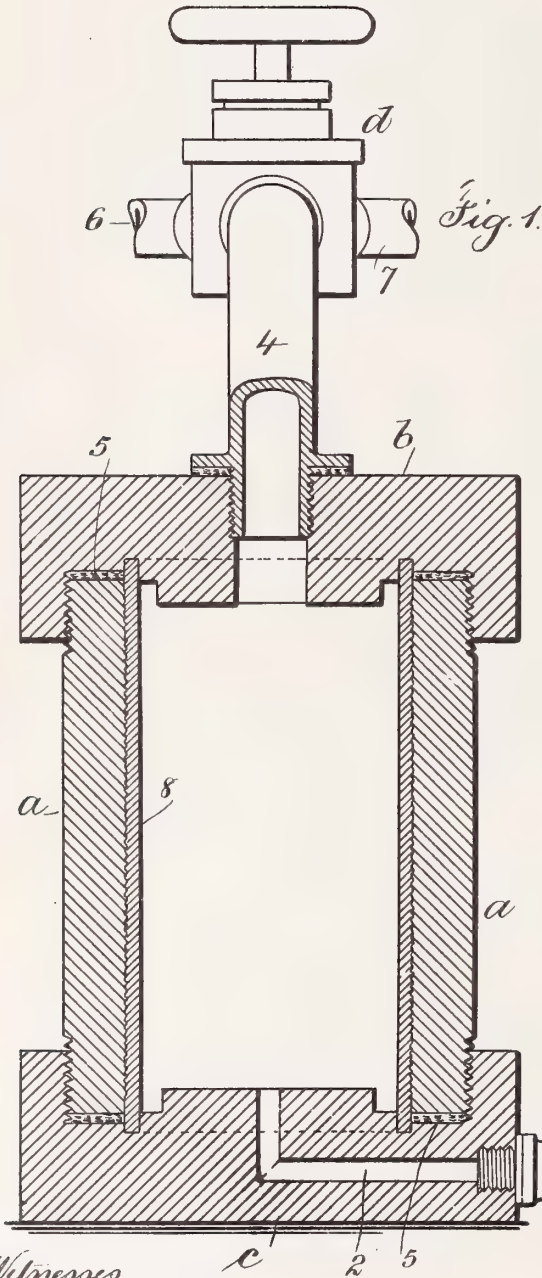


Fig. 1.

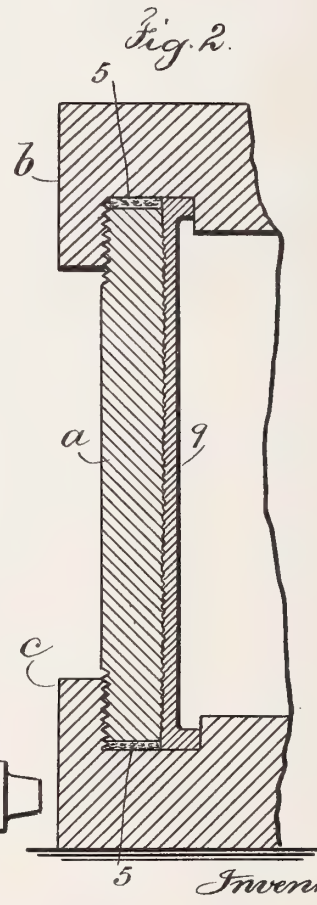


Fig. 2.

Witnesses

Chas. H. Smith
J. Staib

Inventor
Ademor N. Petit.
Per L. H. Larru & Son attys

UNITED STATES PATENT OFFICE.

ADEMOR N. PETIT, OF NEWARK, NEW JERSEY, ASSIGNOR TO HIMSELF AND
ALBERT O. PETIT, OF NEWARK, NEW JERSEY.

APPARATUS FOR MANUFACTURING DUPLICATE SOUND-RECORD CYLINDERS FOR PHONOGRAPHS.

SPECIFICATION forming part of Letters Patent No. 692,337, dated February 4, 1902.

Original application filed December 8, 1900, Serial No. 39,127. Divided and this application filed March 18, 1901. Serial No. 51,594. (No model.)

To all whom it may concern:

Be it known that I, ADEMOR N. PETIT, a citizen of the United States, residing at Newark, in the county of Essex and State of New Jersey, have invented an Improvement in Apparatus for Manufacturing Duplicate Sound-Record Cylinders for Phonographs and Similar Machines, of which the following is a specification.

Various devices and methods have heretofore been employed in the manufacture of duplicate sound-records for phonographs and similar machines; and the object of my present invention is to simplify the apparatus and at the same time to make use of an apparatus in which both heat and pressure may be made applicable.

In carrying out my invention I employ a cylindrical parallel-sided matrix, a head connected to the matrix at one end, and a base connected to the matrix at the other end, and I preferably place packings between the ends of the matrix and the surfaces of the head and base to form a steam and pressure tight joint. The base is provided with an exit-opening and an escape-cock, and the head is perforated and provided with a pipe and a three-way cock with pipes therefrom, one for steam and the other for compressed air.

In the drawings, Figure 1 is a vertical section representing my improved apparatus, Fig. 1 being shown of a structure adapted to one form of duplicate-record cylinder; and Fig. 2 is a partial vertical section representing a form of a construction of cylinder adapted to a form of duplicate sound-record cylinders where there are inturned ends or flanges.

My improved apparatus comprises a matrix *a*, a head *b*, connected by a threaded flange to one end of the said matrix, and a base *c*, connected also by a threaded flange to the other end of the said matrix in a similar manner, there being packings 5 preferably between the ends of the matrix and the head and base, so as to insure tight joints for both steam and air under pressure. The base *c* is provided with an exit-opening 2 and an escape-cock 3, and the head is centrally perforated and provided with a pipe 4. A three-way cock *d* is

connected to the pipe 4, and pipes 6 and 7 extend in opposite directions from said three-way cock, the pipe 6 being for steam and the pipe 7 for compressed air. By these devices steam may be admitted through the pipe 4 to fill the space within the matrix and between the head and base or the steam may be allowed to escape by the cock 3 and compressed air admitted by the pipe 7 through the three-way cock and the pipe 4 to fill the space within the matrix.

In Fig. 1, 8 represents a duplicate sound-record cylinder within the matrix with its opposite ends held in annular grooves in the head and base, the said ends, with the said packings 5, confining both the steam and the compressed air in turn within the matrix and the said cylinder, so that the functions of the steam and the compressed air may be employed for the formation of the duplicate sound-record cylinder within the matrix pursuant to the method set forth in my application for Letters Patent filed December 8, 1900, Serial No. 39,127, and of which the present application is a division.

In Fig. 2 the duplicate sound-record cylinder 9 is shown with inturned ends or flanges, and the head *b* and base *c* are prepared with wider annular grooves for these parts, so that they fit within the grooves in the head and base and also form a substantially tight joint with the packings against the action of the steam or compressed air to prevent the escape of the same, and at the same time to prevent the said steam and compressed air from exercising their full functions upon the duplicate sound-record cylinders as provided in the aforesaid application.

My present application is in no sense related to the duplicate sound-record cylinder as an article or to the operation of the method employed in making the same or the materials of which said duplicate sound-record cylinders are composed. I do not herein limit myself to the manner of forming the matrix. This may be and preferably is made in any manner well known in the art—usually by an electrodeposit upon the surface of an original or master sound-record cylinder

backed up with a substantial metal shell or cylinder from which the master-record is to be removed.

I claim as my invention—

5 1. An apparatus for the manufacture of duplicate sound-record cylinders for phonographs and similar machines, comprising a cylindrical matrix, a head connected thereto by a screw-thread at one end, a base connect-
 10 ed thereto also by a screw-thread at the opposite end, the base being provided with an exit-opening and an escape-cock, a pipe connected to the head at an opening therein, a three-way cock connected to the pipe and
 15 pipes extending therefrom in opposite directions for steam and air, substantially as set forth.

2. An apparatus for the manufacture of duplicate sound-record cylinders for phonographs and similar machines, comprising a
 20 cylindrical matrix exteriorly threaded at the respective ends, a head having a threaded flange and connected to the matrix at one end, a base having a threaded flange and connected to the matrix at the opposite end,
 25 packings between the respective ends of the matrix and the inner faces of the head and base, the base being provided with an exit-opening and escape-cock, a pipe connected to
 30 the head at an opening therein, a three-way

cock connected to said pipe and pipes extending therefrom in opposite directions for steam and compressed air, substantially as set forth.

3. An apparatus for the manufacture of duplicate sound-record cylinders for phonographs and similar machines, comprising a
 35 cylindrical matrix exteriorly threaded at the respective ends, a head having a threaded flange and connected to the matrix at one end, a base having a threaded flange and connected to the matrix at the opposite end,
 40 packings between the respective ends of the matrix and the inner faces of the head and base, the base being provided with an exit-opening and escape-cock, a pipe connected
 45 to the head at an opening therein, a three-way cock connected to said pipe, and pipes extending therefrom in opposite directions for steam and compressed air, the inner surfaces of the head and base being provided
 50 with annular recesses adjacent to the inner surface of the matrix to receive the respective ends of the duplicate sound-record cylinder, substantially as set forth.

Signed by me this 13th day of March, 1901. 55

ADEMOR N. PETIT.

Witnesses:

GEO. T. PINCKNEY,
 S. T. HAVILAND.

No. 692,363.

Patented Feb. 4, 1902.

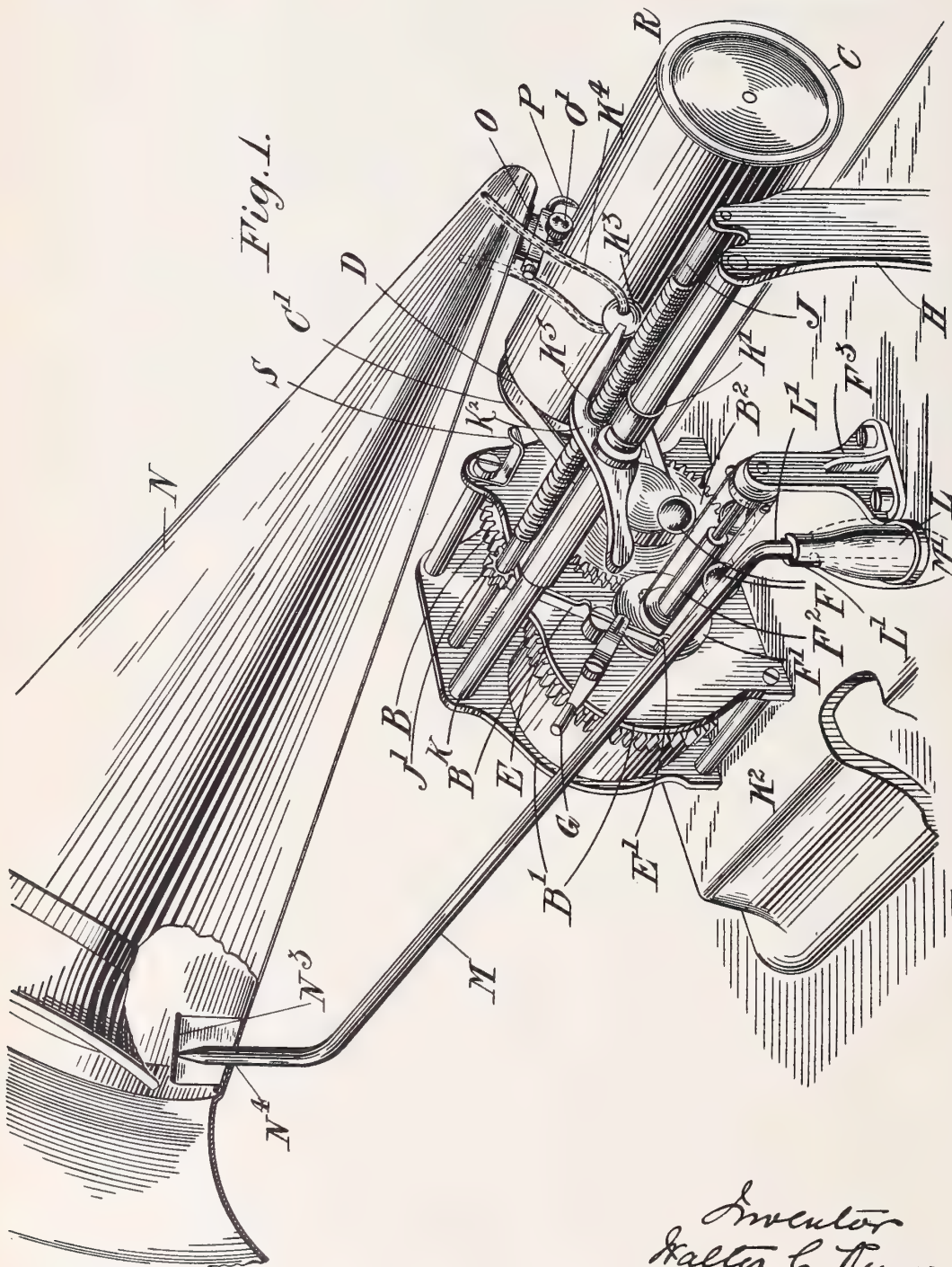
W. C. RUNGE.

GRAPHOPHONE, PHONOGRAPH, OR THE LIKE.

(Application filed June 3, 1901.)

(No Model.)

2 Sheets—Sheet 1.



Witnesses
H. J. Gilmann, Jr.
J. J. M. & Co.,

Inventor
Walter C. Runge
by Louis Freeman
Attorneys

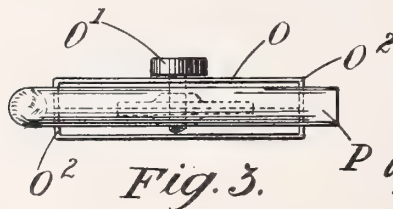
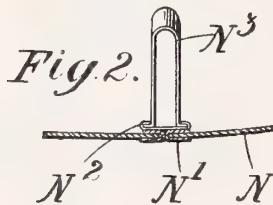
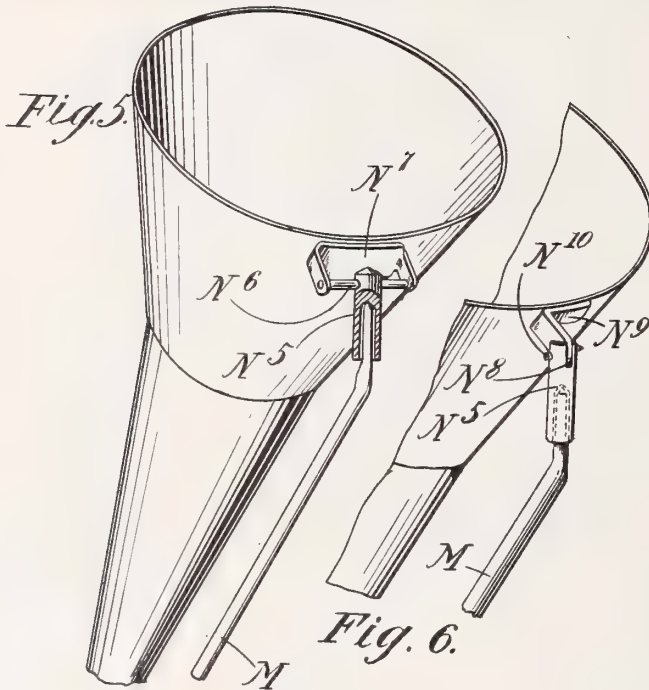
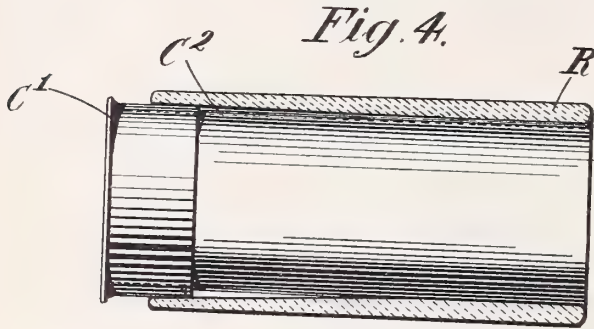
W. C. RUNGE.

GRAPHOPHONE, PHONOGRAPH, OR THE LIKE.

(Application filed June 3, 1901.)

(No Model.)

2 Sheets—Sheet 2.



Witnesses
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J. J. McCarthy.

Inventor
Walter C. Runge
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UNITED STATES PATENT OFFICE.

WALTER C. RUNGE, OF LONDON, ENGLAND.

GRAPHOPHONE, PHONOGRAPH, OR THE LIKE.

SPECIFICATION forming part of Letters Patent No. 692,363, dated February 4, 1902.

Application filed June 3, 1901. Serial No. 62,991. (No model.)

To all whom it may concern:

Be it known that I, WALTER C. RUNGE, a citizen of the United States of America, residing at London, England, have invented certain new and useful Improvements in or Relating to Graphophones, Phonographs, or the Like, (for which application has been made in Great Britain under No. 9,727, dated May 10, 1901,) of which the following is a specification.

This invention relates to graphophones, phonographs, and other like instruments for reproducing sounds from records, its object being the construction of an instrument which, while thoroughly efficient in operation, is simple and cheap to manufacture.

The improvements are primarily applicable to instruments which are not provided with a diaphragm at the small end of the trumpet, but have a stylus of hardened material attached to some part of the trumpet, the point of this stylus following the channels or grooves of the record in the well-known way. It is, however, to be understood that the improvements are not necessarily restricted to this particular type of instrument.

In the accompanying drawings, Figure 1 is a perspective view of one construction of graphophone embodying the improvements according to this invention. Figs. 2, 3, and 4 are detailed views showing portions of the instrument separately, and Figs. 5 and 6 are perspective views showing alternative constructions of another portion of the instrument.

Like letters indicate like parts throughout the drawings.

With reference first to Fig. 1, A is a base-plate, preferably of cast metal of considerable thickness, so that it may be heavy and rigid. Upon this base is fixed a motor, comprising in the example illustrated a train of wheels B, mounted between two plates B', one member B² of the train being preferably of hard fiber or other non-metallic material. From this motor a record-carrying mandrel C is driven by means of a belt D and a pulley C'. The train of wheels forming the motor is driven from a spring coiled in a barrel B³ and wound up when necessary, and the rate of rotation of the record-mandrel C may be regulated by a lever E, controlled by a screwed

rod or other mechanism. (Not shown in the drawings.) One end of this lever E is furnished with a brake-block E'—say of leather—which presses against a disk F', connected to governors F, the action of the governors being to draw the disk F' away from the plate B' along a rod F², supported between that plate and a standard F³, secured to the base A. A lever G is provided, by means of which the motor may be started and stopped.

Mounted free to turn between the outer plate B' and a standard H is a fine-threaded screw J, provided with a pinion J', which is driven from one of the wheels B. Parallel to this screw J and also held between the plate B' and the standard H is a rod K, which forms a guide upon which a sleeve K' can travel and turn. This sleeve K' forms part of a pivoted guide-carrier comprising also a lever K², a head K³, and a guide-fork K⁴, the arms of the latter being covered with rubber tubing or other soft or yielding material. Normally the guide-carrier K² K³ lies upon the fine-threaded screw J, as shown in Fig. 1, and it is provided with a knife-edge K⁵ or otherwise adapted to engage with the thread of the screw J, so that when the latter rotates the guide-carrier may be caused to travel along the bar K.

Upon the base-plate A is a socket L, having a central vertical hole which accommodates the end of a rod M, the pointed extremity of which serves as a pivot to support the larger end of a sound-trumpet N. Slots L' are provided in the socket L, and pins M' upon the rod M engage with these slots when the rod M is in the socket, thus securing a definite position for the pivot of the sound-trumpet.

The sound-trumpet N may be made of any suitable material, preferably non-metallic—such, for instance, as tough paper, thin fiber, or celluloid. When sheet material, such as celluloid, is employed, the trumpet is conveniently made by providing the edges of the sheet with metal strips or grips, as shown at N' in Fig. 2, these strips being joined—say by soldering. In some constructions only one strip is used, its edges being turned over, so as to grip the edges of the sheet material of which the trumpet is formed. To the strips N' inside the larger end of the trumpet is at-

tached a small clip N², forming a slide, into which the edges of a U-shaped piece of metal N³ are inserted. The pointed end of the rod M passes through a hole N⁴ and rests against the inside of the curved portion of the U-shaped piece N³. This U-shaped member is preferably formed so that the longitudinal portion which rests upon the point of the rod M is approximately horizontal, thus obviating the danger of any binding action taking place.

Near the smaller end of the trumpet N a socket O is provided to accommodate the stylus P, which may be of any hard material—say, for instance, glass rod or tubing. The socket O is preferably formed of spring metal and provided with a screw O', so that the stylus may be securely gripped. In the construction shown in detail in Fig. 3 the ends of the socket are turned in, as at O², so that the stylus is gripped by each end of the socket, the clamping-screw O' being in the middle.

In operation the larger end of the trumpet is pivoted, as above described, on its supporting-rod M, the smaller end passes between the arms of the fork K⁴ of the pivoted carrier, and the point of the stylus P rests upon a record-cylinder R, which is mounted friction-tight upon the mandrel C. This mandrel may be made, as shown in Fig. 4, of a piece of light tubing C², the diameter of which corresponds to that of the smaller end of the coned interior of the record R. At one end the tube C² is secured to a ring which fits the inside diameter of the larger end of the record R and conveniently forms part of the pulley C'. This ring may, if desired, be slightly coned in order to fit the adjacent portion of the interior of the record.

It is to be understood that the apparatus is so constructed that the point of the stylus P rests with a slight amount of pressure upon the record R. The guide-carrier K² K³ and fork K⁴ are not intended to take the weight of the trumpet, their function being primarily to act as a guide for the smaller end of the trumpet and prevent any danger of the point of the stylus quitting the grooves or channels in the record.

In order that the point of the stylus P may be withdrawn from contact with the record R or any adjacent part of the mechanism when the instrument is not in use, a small safety catch or bracket S is provided, attached to one of the plates B'. By depressing the back end of the carrier-lever K² the knife-edge K⁵ is disengaged from the screw J and the lower end of the trumpet, with the stylus P, is lifted in the guide-fork K⁴, and the head K³ is then allowed to rest in the catch S, in which position the stylus is out of contact with adjacent portions of the instrument.

The rest or catch is not necessarily in the form of the bracket S. It may, for example, be formed by causing the arms of the fork K⁴ to approach one another in a V shape below the portion receiving the trumpet, so that

when the back end of the lever K² is depressed this contracted or V-shaped part of the fork engages with, say, the back of the stylus-clip and lifts it, with the trumpet, clear of the record.

Figs. 5 and 6 show portions of sound-trumpets made according to an alternative construction of this invention. In each of these forms a pivoted socket N⁵ is provided, which accommodates the pointed end of the rod M. In Fig. 5 this socket is shown provided with a cross-arm N⁶, which is journaled in the downturned ends of a plate N⁷, attached to the trumpet. In the form shown in Fig. 6 the socket N⁵ is slotted, as at N⁸, and in this slot is a lug N⁹, secured to the trumpet, the lug and the slotted socket being pivotally connected by a pin N¹⁰.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In a graphophone, the combination with the mandrel and record, of means for rotating the mandrel, a sound-trumpet and pivotal means for supporting its larger end, means for supporting its smaller end, a pivoted guide for the smaller end of the trumpet, means for feeding said guide, and means for rocking said guide on its pivot, substantially as described.

2. In a graphophone, the combination with the mandrel and record, of means for rotating the mandrel, a sound-trumpet and pivotal means for supporting its larger end, an adjustable socket attached to the smaller end of the trumpet, a stylus secured in said socket and adapted to rest upon the record and support the smaller end of the trumpet, a screw and means for rotating the same, a rod arranged parallel to said screw, a pivoted guide-carrier slidably mounted upon said rod and adapted to engage said screw, a fork carried by said guide-carrier and arranged to guide the smaller end of the trumpet, means for rocking said guide-carrier on its pivot to lift the smaller end of the trumpet and the stylus clear of the record, and means for holding the stylus out of contact with adjacent parts of the mechanism when the instrument is out of operation, substantially as described.

3. In a graphophone, the combination with the mandrel and record, of means for rotating the mandrel, a sound-trumpet and pivotal means for supporting the larger end of the same, a stylus connected to the trumpet and adapted to rest upon the record and support the smaller end of the trumpet, a pivoted guide for the smaller end of the trumpet, means for feeding said guide, and means for rocking it on its pivot to lift the stylus from the record, substantially as described.

4. In a graphophone, the combination with the mandrel and record, of means for rotating the mandrel, a sound-trumpet and pivotal means for supporting the larger end of the same, a stylus connected to the trumpet and adapted to rest upon the record and support the smaller end of the trumpet, a pivoted, slidably-mounted guide-carrier supporting a

guide for the trumpet, means for feeding said guide-carrier, and means for rocking it upon its pivot to lift the stylus from the record, substantially as described.

5 5. In a graphophone, the combination with the mandrel and record, of means for rotating the mandrel, a sound-trumpet, means for supporting the smaller end of the trumpet, and means for pivotally supporting the larger
10 end of the trumpet, consisting of a vertical socket provided with vertical slots, a bent rod supported in said socket and provided with pins engaging said slots and also provided with a pointed extremity entering a
15 hole in the side of the larger end of the trumpet, and a U-shaped piece over said hole within the larger end of the trumpet and arranged with a substantially horizontal longitudinal portion resting upon the point of the
20 bent rod, substantially as described.

6. In a graphophone, the combination with the mandrel and record, of means for rotating the mandrel, a sound-trumpet, and means for supporting its larger end, consisting of a
25 vertical socket provided with slots, a bent rod supported in said socket and provided with pins engaging said slots, said rod being also provided with a pointed extremity entering a hole in the side of the larger end of the
30 trumpet, and a U-shaped piece over said hole within the larger end of the trumpet and arranged with a substantially horizontal longitudinal portion resting upon the point of the rod, an adjustable socket attached to the
35 smaller end of the trumpet, a stylus secured therein and adapted to rest upon the record and support the smaller end of the trumpet, a screw rotatably mounted parallel to the axis of the record, means for rotating the same, a

pivoted guide-carrier slidably mounted upon 40 a rod and adapted to engage said screw, a fork carried by said guide-carrier and arranged to guide the smaller end of the trumpet, means for rocking said guide-carrier on its pivot to
45 lift the smaller end of the trumpet and the stylus clear of the record, and means for holding the stylus out of contact with adjacent parts of the mechanism when the instrument is out of operation, substantially as described.

7. In a graphophone, the combination with 50 the mandrel and record, of means for rotating the mandrel, a sound-trumpet, means for supporting the larger end thereof, consisting of a socket provided with slots, a rod supported in said socket and engaging the slots 55 said rod being provided with a pointed extremity entering a hole in the side of the larger portion of the trumpet, and a U-shaped piece within the trumpet having an approximately horizontal longitudinal portion resting upon the point of the rod, a stylus connected to the trumpet adapted to rest upon the record and support the smaller end of the trumpet, a screw, means for rotating the
60 same, a pivoted, slidably-mounted guide-carrier adapted to engage said screw and provided with a fork to guide the smaller end of the trumpet, and means for rocking said carrier on its pivot to lift the stylus from the record, substantially as described. 70

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

WALTER C. RUNGE.

Witnesses:

HAROLD WADE,

HARRY B. BRIDGE.

No. 692,409.

Patented Feb. 4, 1902.

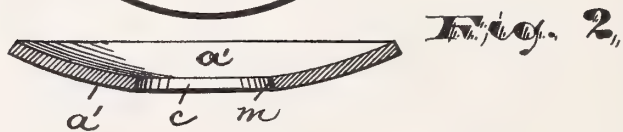
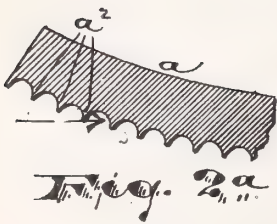
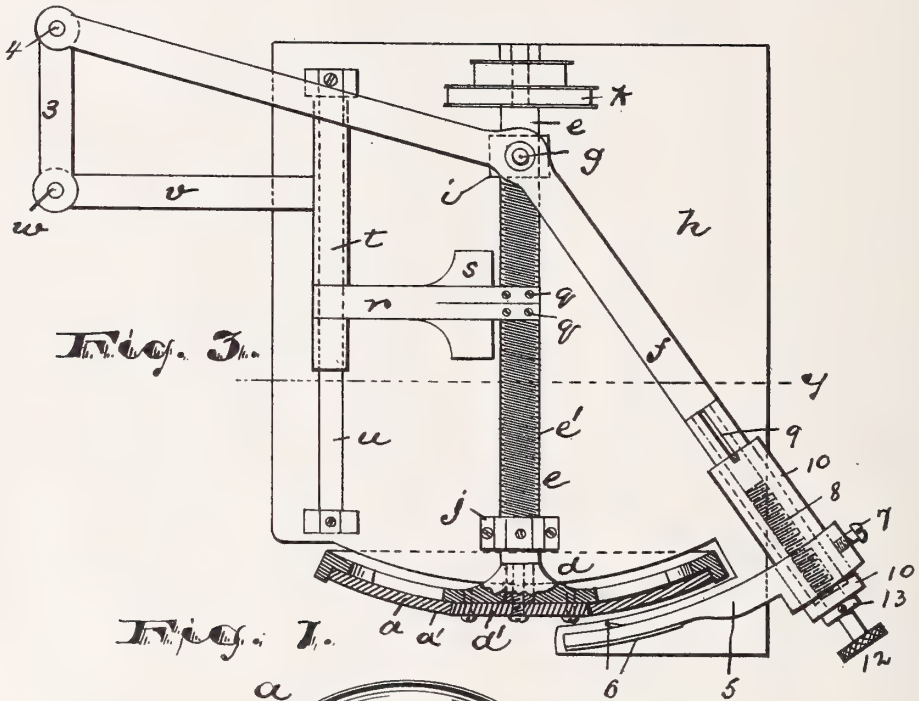
J. E. ALEXANDER.

TALKING OR SOUND RECORDING AND REPRODUCING MACHINE.

(Application filed Sept. 28, 1900.)

(No Model.)

2 Sheets—Sheet 1.



WITNESSES:

B. B. Tibbitts.
Henry Kueg

INVENTOR:

John E. Alexander,

BY

Frank G.

ATTORNEYS.

No. 692,409.

Patented Feb. 4, 1902.

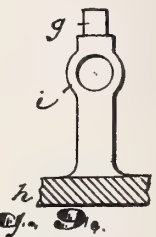
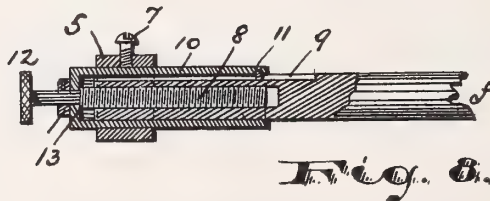
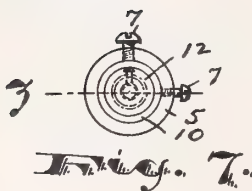
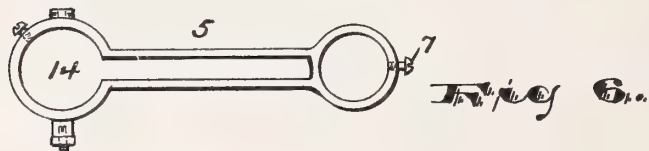
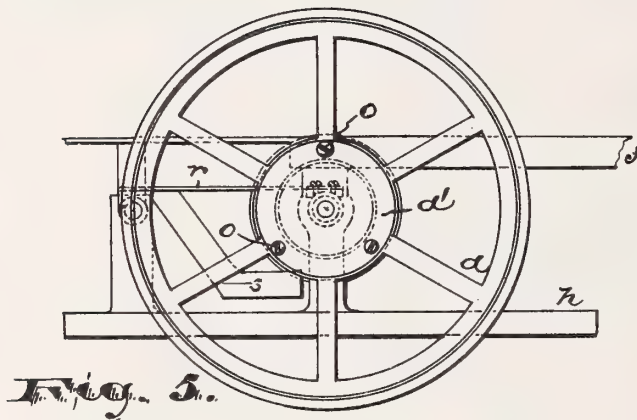
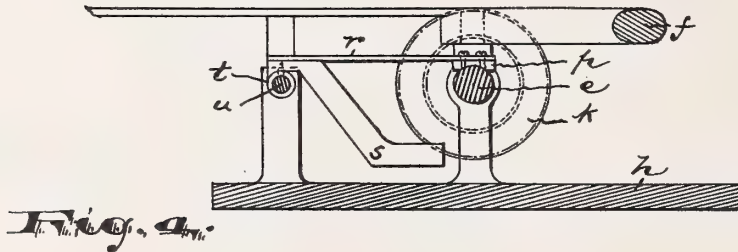
J. E. ALEXANDER.

TALKING OR SOUND RECORDING AND REPRODUCING MACHINE.

(Application filed Sept. 28, 1900.)

(No Model.)

2 Sheets—Sheet 2.



WITNESSES:

Russell M. Everett.
Henry Krug

John E. Alexander

BY

Drake & Co.
ATTORNEYS.

UNITED STATES PATENT OFFICE.

JOHN E. ALEXANDER, OF WEST ORANGE, NEW JERSEY, ASSIGNOR TO
THE GENERAL PHONOSPHERE CORPORATION, A CORPORATION OF
NEW JERSEY.

TALKING OR SOUND RECORDING AND REPRODUCING MACHINE.

SPECIFICATION forming part of Letters Patent No. 692,409, dated February 4, 1902.

Application filed September 28, 1900. Serial No. 31,357. (No model.)

To all whom it may concern:

Be it known that I, JOHN E. ALEXANDER, a citizen of the United States, residing at West Orange, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Talking or Sound Recording and Reproducing Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to characters of reference marked thereon, which form a part of this specification.

The objects of this invention are, first, to enable a larger superficial area of reproducing or recording cuts or engravings to be obtained, whereby a high rate of speed, and consequently a greater volume of sound, may be maintained without quickly terminating the period of sound reproduction; to secure greater durability in the record; to secure more perfect reproduction of tone, and to more effectually avoid the tones or sounds not common to the human voice, musical instruments, or other original sounds thrown into the recorder; to prevent warping of the record and to secure a construction thereof better capable of resisting the effects of concussion in handling and transportation; to enable the records to be compactly stored or packed for shipment; to provide a more simple, inexpensive, and durable machine for operating in connection with the improved record to produce the sounds, and to secure other advantages and results, some of which may be referred to hereinafter in connection with the description of the working parts.

The invention consists in the improved sound-reproducing machine and in the arrangements and combinations of parts of the same, all substantially as will be hereinafter set forth, and finally embraced in the clauses of the claim.

Referring to the accompanying drawings, in which like characters of reference indicate corresponding parts in each of the several views, Figure 1 is a plan of the improved record-blank. Fig. 2 is a central section of

the same, taken at line x , Fig. 1. Fig. 2^a is a detail, on a large scale, illustrating the engraved surface of a record ready for service. Fig. 3 is a plan of a speaking-machine having the said blank (shown in section) in position therein. Fig. 4 is a section taken at line y , Fig. 3. Fig. 5 is a detail front elevation to show more particularly the construction of the record-holder. Fig. 6 is a detail of a speaker or sound-box and record-holder. Fig. 7 is a detail front view of the means for adjusting the speaker or sound-box and record-holder. Fig. 8 is a section of the same on line z , and Fig. 9 is a detail elevation of a post or stud used as a shaft bearing and fulcrum.

In said drawings, a indicates the record-blank, composed of wax or wax-like composition or other material capable of being engraved or receiving impressions due to the action of sound waves or vibrations, either mechanically, chemically, or electrically, or by any of the methods common in the art of producing talking-machine records. Said blank a is provided with a spherical surface a' or a surface resembling in conformation that of a sphere in that the convex curvature of said blank is formed at all effective points at an equal radial distance from a given center. Said blank a is preferably a segment of a sphere and is centrally perforated, as at c , to receive the holder d or the clamp-plate d' of the holder, whereby the blank or record can be easily and conveniently seated in operative relation, as hereinafter described. In ordinary operation of the machine the blank rotates on an axial mandrel or shaft e , and the engraving-tool or the tracing instrument of the reproducer or of the speaker moving with its carrier f on a fulcrum or axial center g , near or approximately at the axial center of the shaft e , describes a course concentric with the curvature of the record or blank, the said tool or tracer moving from the periphery of the record inward toward the center. In thus moving inward it may be observed that the tracing instrument bears laterally, as indicated by the arrow, against the partition-walls a^2 , Fig. 2^a; but because of the convexity of the engraved surface the said

instrument tends to wear not so directly against the thin partitions as heretofore, but into the body of the record, thus tending greatly to increase the durability of the said record, as will be understood.

Upon a bed-plate *h* (shown in plan in Fig. 3) are bearings or journal-boxes *i, j*, providing supports for the main shaft *e*, upon which the holder *d* for the record or record-blank *a* is fastened. In the construction of the present case said shaft is provided with screw-threads *e'* and is driven by a pulley *k*, deriving its power from a motor of any ordinary variety. The blank or record holder secured to the said main shaft consists of a convex frame or plate adapted to fit against the (preferably) concave back of the record or blank, said frame or plate rotating with the main shaft as its axis. The blank in the construction shown is beveled at the walls of the central perforation, as at *m*, and against said beveled walls the clamp-plate *d'*, having correspondingly-beveled peripheral edges, bears, said clamp-plate being secured to the holder by screws *o* or attaching means of any suitable construction, the said plate fitting in the perforation, so that the record may be exactly placed in proper operative position.

In the construction preferred for the purposes of this application I arrange on the main shaft a threaded nut or nuts *p*, (shown more clearly in Fig. 4,) the threads of which correspond with those on the main shaft *e*, so that when said main shaft rotates under the power imparted by the pulley *k* said nuts will be caused to move lengthwise of said shaft. Said nuts are attached by means of screws *q* or other suitable means to an arm *r*, preferably having a weight *s*, by which last the nuts are held down in proper operative relation to the screw-shaft. Said arm *r* may be a flat spring or otherwise. Said arm in turn is attached to a sleeve or collar *t*, arranged on a slideway *u*, formed or constructed to lie parallel with the main shaft *e*, and said collar is provided with a second arm or lateral extension *v*, having a pivotal connection at its projecting extremity, as at *w*, with a connecting-rod 3, pivotally connected in turn at 4 with an oscillating lever *f*, fulcrumed at *g* in the line, in plan, of the axis of the main shaft, as shown in Fig. 1. By the arrangement of parts thus described by turning the main shaft and longitudinally moving the nuts, arm *r*, sleeve *t*, and arm *v* together in a direction parallel with the shaft *e* the lever *f*, connected with said moving parts, is turned on its fulcrum lying at the axis of the main shaft, so that its free arm turns or is given an oscillating movement. The convexity of the record attached to its holder and the path of the speaker or sound-box or the recorder arranged upon their holder are concentric or closely approximate a concentric relation, so that as the record or the record-blank rotates on its main shaft and the tracing or speaking instrument or the cutting or engraving in-

strument oscillates the said instrument will maintain a proper operative contact with said record or record-blank.

Upon the free end or arm of the lever is adjustably arranged the holder 5 (shown in plan in Fig. 6) for the speaker or sound-box reproducer or the shaving device, (not shown, excepting in part in Fig. 3, where the stylus of one of said devices appears at 6,) said speaker or sound-box reproducer and shaving device being constructed in any manner common to those now in ordinary and general use. Said holder 5 is adjustably attached by means of a set-screw 7 or other suitable means to an adjustable sleeve arranged at the free end or arm of the lever *f*. Any suitable holder-adjusting means may be employed; but I have used with convenience and advantageous results the construction illustrated in Fig. 8, where the lever *f* is shown to be provided interiorly with a screw 8, engaging a female thread in said lever and at its periphery is longitudinally grooved, as at 9. On said lever *f* is placed the sliding sleeve 10, held from turning on the lever by a pin 11, which projects into the groove 9. Near its forward extremity said screw 8 provides a bearing at which it is loosely connected to the sleeve 10, so that when said screw is turned the said sleeve is moved lengthwise of the arm of the lever on which it is seated, the pin 11 preventing the sleeve from turning on said arm. The turning of the screw is facilitated by means of a finger-piece 12, and longitudinal independence of movement of the screw and sleeve is prevented by shoulders, collars 13, or the like. By turning the screw 8, the sleeve 10, holder 5, which last projects laterally from the sleeve to a point in front of the rotary record, and the speaker, reproducer, or the shaver carried by said holder 10 in the socket or seat 14, Fig. 6, are moved toward or from the face of the record or the record-blank and the speaking, engraving, or shaving tool or instrument may be entered into engagement with the surface of said record or blank with microscopic nicety of adjustment to effect the desired results with perfection.

I am well aware that many changes may be made in the construction of the machine without departing from the spirit of the invention.

Having thus described the invention, what I claim as new is—

1. In a sound-reproducing machine, the combination with a rotary main shaft having means for holding the record, means for rotating said shaft, a lever having a speaker or sound-box holder and being connected with said main shaft and movable simultaneously therewith to cause the speaker to move in a curved path, of a spherically-convex record, the convexity of which is concentric with the path of movement of the speaker, substantially as set forth.

2. In a sound-reproducing machine, the combination with a rotary main shaft having

means for holding the record and effect a rotation of said record, of a lever fulcrumed, in plan, in the axial line of the main shaft, and connection of said main shaft and lever for transmitting movement from one to the other, substantially set forth.

3. In a sound-reproducing machine, the combination with a rotary shaft and its record having a convex surface, of a pivotally-moving speaker-holder adapted to traverse in a curved path the said curved surface, and means for transmitting power from said shaft to said speaker-holder, substantially as set forth.

4. In a sound-reproducing machine, the combination with the threaded main shaft having a record-holder, of a nut engaging said main shaft, a lever carrying a speaker-holder, and connections between said nut and lever, substantially as set forth.

5. In a sound-reproducing machine, the combination with the threaded main shaft having a record-holder, a nut engaging said main shaft, an arm *r*, carrying said nut, a sliding sleeve *t*, and arm *v*, pivoted connections *s*, lever *f*, loosely connected to said connection, and an adjustable speaker-holder, substantially as set forth.

6. The combination with a rotary record-holder, of a speaker or sound-box holder mov-

able in a curved path on a center coincident, looking in one direction, with the axial center line of the record-holder, and means for rotating said record-holder and moving said speaker or sound-box holder, substantially as set forth.

7. The combination with the stylus, in a sound-reproducing machine, of a segment of a sphere seated at its center upon the extremity of a rotary shaft and means for rotating said shaft and means for effecting a spiral tracing of the stylus on the curved surface of the segment, substantially as set forth.

8. A sound-reproducing device provided with a record comprising the segment of a sphere, said segment being supported on the end of a rotary shaft and movable with said shaft, in combination with reproducing means so supported in connection with said segment as to travel in the arc of a great circle concentric with a curvature of said segment, substantially as set forth.

In testimony that I claim the foregoing I have hereunto set my hand this 20th day of September, 1900.

JOHN E. ALEXANDER.

Witnesses:

CHARLES H. PELL,

LOUIS A. GREENLEAF.

19/11/11

No. 692,502.

Patented Feb. 4, 1902.

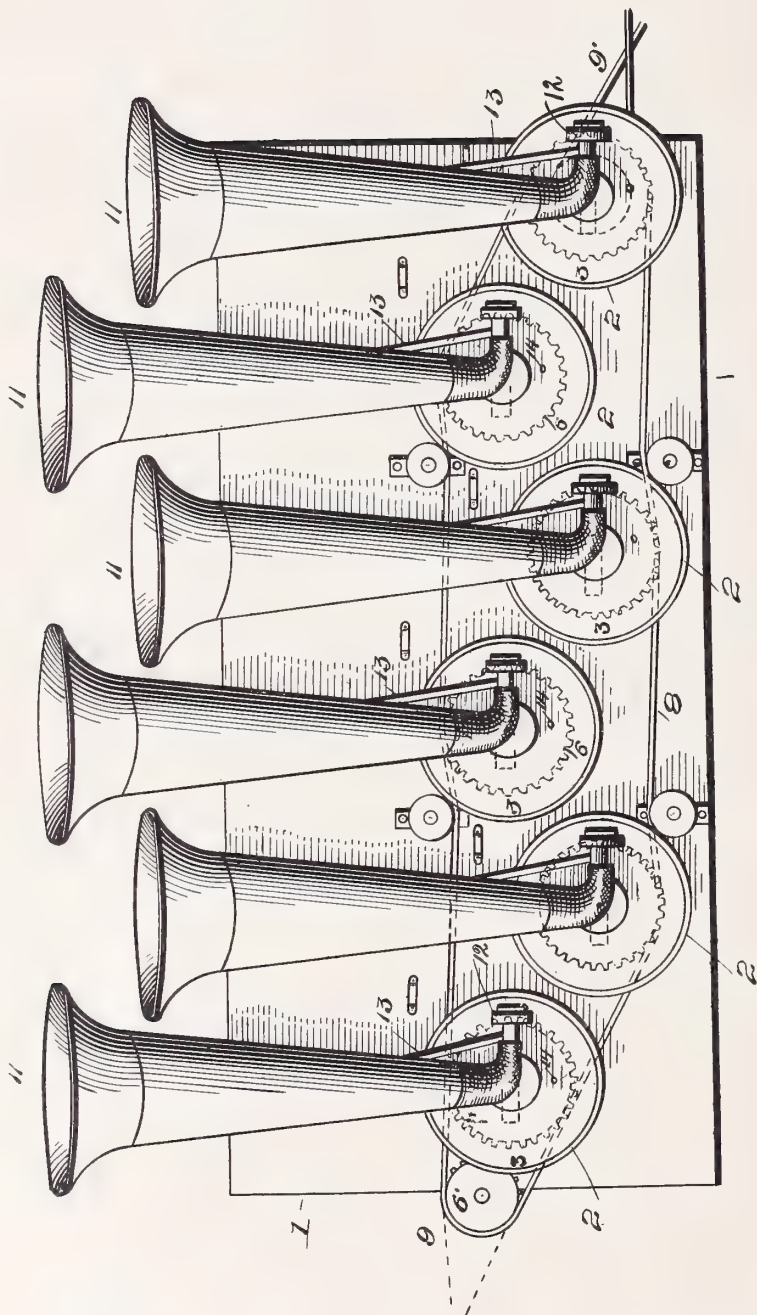
E. BERLINER.
GRAMOPHONE.

(Application filed June 13, 1900.)

(No Model.)

2 Sheets—Sheet 1.

Fig. 1.



Witnesses:
J. M. Fowler Jr.
F. J. Chapman

Inventor:
Emile Berliner,
By Lyons & Bisling.
Attys.

No. 692,502.

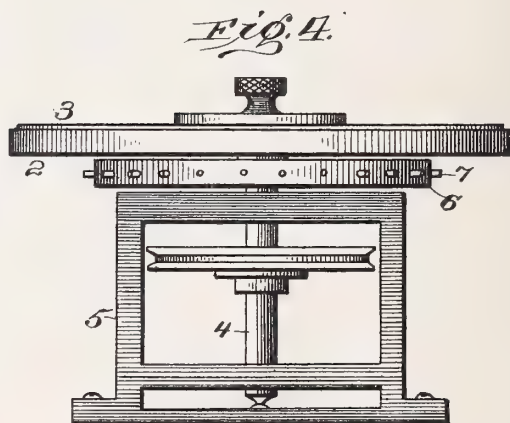
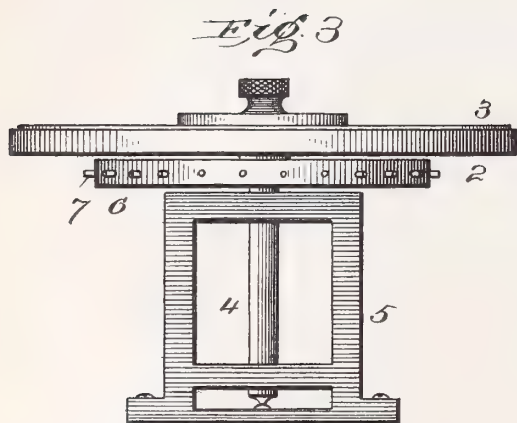
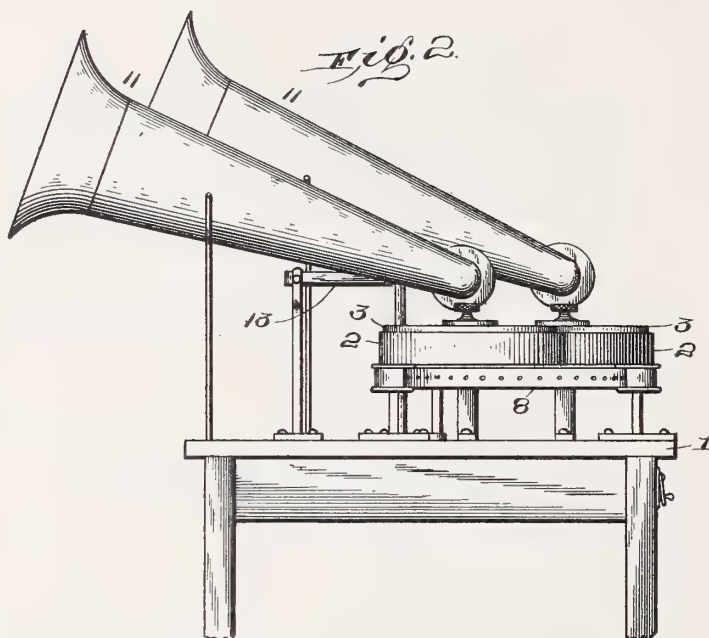
Patented Feb. 4, 1902.

E. BERLINER.
GRAMOPHONE.

(Application filed June 13, 1900.)

(No Model.)

2 Sheets—Sheet 2.



Witnesses:
J. M. Fowler Jr.
J. J. Chapman

Inventor
Emile Berliner
By Lyons & Birnie
Attys

UNITED STATES PATENT OFFICE.

EMILE BERLINER, OF WASHINGTON, DISTRICT OF COLUMBIA.

GRAMOPHONE.

SPECIFICATION forming part of Letters Patent No. 692,502, dated February 4, 1902.

Application filed June 13, 1900. Serial No. 20,170. (No model.)

To all whom it may concern:

Be it known that I, EMILE BERLINER, a citizen of the United States, residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Gramophones, of which the following is a specification.

My invention has reference to improvements in gramophones, whereby any desired volume of sound may be produced from the existing commercial form of gramophone sound-records and sound-reproducing instrumentalities.

My invention is based on the fact that gramophone-records are exact duplicates of each other, even to the minutest detail, and as such are made in large numbers. Now I have discovered that if a number of such duplicate records be rotated in such synchronism as may be obtained by ordinary gearing or the like and to each be applied the stylus of a reproducer-head preferably provided with the usual amplifying-horn, so that all the styles shall touch the records at substantially the same point and so that there will be emitted from each horn identically the same sounds, these sounds will combine into a resultant sound of greatly-increased volume, proportional to the number of records and reproducing instrumentalities used.

My invention consists, therefore, of a gramophone-reproducer composed of a number of rotating tables coupled for synchronous movement to a common motor, a corresponding number of identical gramophone-records, and a corresponding number of gramophone reproducer-heads, preferably provided with amplifying-horns so mounted that the reproducer-styles may be placed at corresponding points on the records. In order to enable the operator to place the styles upon identically-corresponding points of the records without the exercise of any special care, I may employ a means for insuring the exact register of each record upon its supporting-table, so that the placing of the records upon the tables will bring them all into exactly the same relative position.

A multiple gramophone reproducer embodying my invention is shown in the accompanying drawings, forming part of this specification, in which—

Figure 1 is a plan view. Fig. 2 is a side elevation, and Figs. 3 and 4 are side elevations of details of the structure.

Referring to the drawings, there is shown a bench or support 1, upon which are mounted a number of rotary tables 2 of the usual gramophone type and adapted to receive the usual gramophone record-tablets 3 of commerce. The rotary tables may for convenience be arranged in a staggered row, as shown in Fig. 1. Each table is supported upon an upright spindle or shaft 4 journaled near its upper and lower ends in a standard 5, fast on the bench 1. The shaft 4 is pointed at its lower end and stepped in a suitable bearing in the standard, as shown.

Upon each shaft 4, just below the table 2, there is secured a disk 6, having equally-spaced radially-projecting pins 7 on its periphery. The disks 6 are all of the same size, with the same number of pins, and they are driven, together with the tables 2, all at the same speed by means of a belt 8, having perforations spaced to fit the pins 7. This belt is preferably made of leather because of its flexibility and easy-running qualities. The belt is continuous and need engage only a few pins or teeth on each of the intermediate disks 6, as shown in Fig. 1. At the ends of the row of tables the belt may pass around the disks in the manner shown at the right hand of Fig. 1 or around a small supplemental disk 6'. (Shown at the left-hand end of Fig. 1.) This latter disk 6' may be adjustable, so as to serve as a belt-tightener. It may also be provided with a pulley (not shown) for the application of power to drive the system of rotary tables through a belt 9, (indicated by dotted lines.) However, I may apply the driving-power from a belt 9' at the other end of the machine.

The horns 11 are of ordinary construction, as are the reproducer-heads 12, mounted upon the swinging arms 13.

In order to insure that each record is placed in the same relative position on the table 2, I may provide each record with an orifice 14, the orifices in each identical record of a set being in the same relative position on the record. Such orifices could be made when the record is pressed. The tables 2 are provided with pins registering with the orifices. Other forms of registering devices might natu-

rally be employed. It is also plain that I may use spur, worm, bevel, or other gearing instead of the belt-gearing shown in the drawings, so long as it is common to the several records, and thus drives them synchronously.

In operation the records are placed on their tables or supports, as described, and the reproducing-styles are brought down on the first lines of the records. The registering devices 14 make it possible to insure the contact of each stylus with the corresponding point of each record by the mere act of placing the stylus on the proper line of the record. The proper point of that line is determined automatically by the length of the swinging arm 13. Power being applied to rotate the records, identical sounds are found to issue from each of the horns, and it will be found that the combined body of sound may be made as great as desired by using an appropriate number of records, but will always be what may be termed an "enlargement" or "amplification" of the sound which would be produced by a single record. Thus suppose a speaker should have made a record of his own voice and that gramophonic duplicates of this record were produced. By my invention, as above described, it would be possible for the speaker to hear an exact reproduction of his own voice louder than he could himself speak. The same remark applies to a vocalist, and a corresponding remark would apply to a violinist or pianist.

It will thus be seen that I am enabled to produce a sound-reproducing apparatus which can give sounds the same in quality as those now existing, but very much louder in intensity and without the slightest distortion. Furthermore, I have a convenient means of making the intensity of the sound precisely what I desire by simply selecting the proper number of records. It will also be seen that my invention enables me to produce for commercial purposes at least a better quality of record. Heretofore it has been customary to produce records by having the operator whose voice is to be recorded speak quite loudly into the recording apparatus in order that the record might be made to reproduce as loudly as is possible. This has tended to distort the natural voice which was to be recorded. Under my present invention the

person whose voice is to be recorded may speak or sing quite naturally during the recording operation, and I may yet secure a greater degree of loudness than before by properly choosing the number of records to be simultaneously reproduced. Similar remarks apply to other kinds of records.

What I claim is—

1. A sound-reproducing machine comprising the combination of a number of identical records, reproducing-styles arranged for contact at corresponding points thereof, and mechanism common to all of the identical records for producing a relative but synchronous movement between the records and styles, substantially as described.

2. A sound-reproducing machine comprising the combination of a number of identical records, gearing common to the records for driving them synchronously and reproducing-styles arranged for contact with corresponding points of the records, substantially as described.

3. A sound-reproducing machine comprising the combination of a number of identical records, registering mechanism for insuring the exact register of each record upon its support, reproducing-styles arranged for contact with corresponding points of the records and mechanism common to all of the identical records for producing a relative but synchronous movement between the records and styles, substantially as described.

4. A sound-reproducing machine comprising a number of rotatable tables or record-supports each provided with a pin so placed that all the pins correspond in position, a number of identical records, one for each table, and each having an orifice registering with the pin on its table or support, reproducing-styles arranged for contact with corresponding points of the records, and mechanism common to all the supports for rotating the record-supports synchronously, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

EMILE BERLINER.

Witnesses:

EDWIN S. CLARKSON,
C. E. MARSHALL.

No. 692,623.

Patented Feb. 4, 1902.

A. CLARK.
SEAL FOR PHONOGRAPHIC RECORDS.

(Application filed Dec. 7, 1900.)

(No Model.)

Fig. 1.

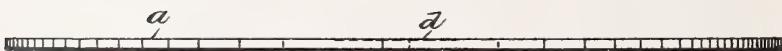
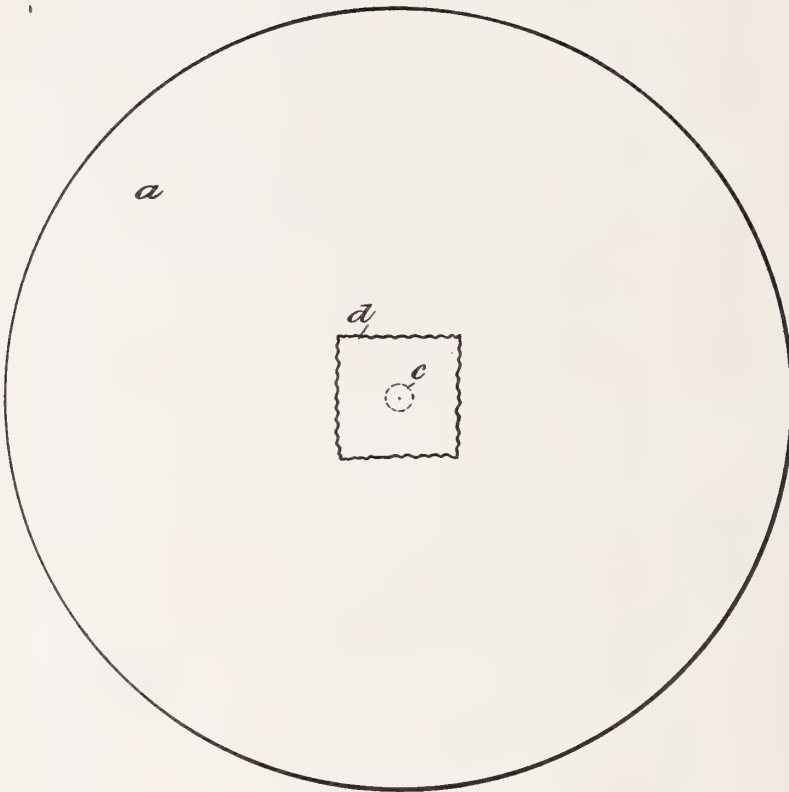


Fig. 2.

Witnesses
[Signature]
Fred Wherry

Inventor
Alfred Clark
By *his* Attorney *Fred C. Fischer*

UNITED STATES PATENT OFFICE.

ALFRED CLARK, OF PARIS, FRANCE.

SEAL FOR PHONOGRAPHIC RECORDS.

SPECIFICATION forming part of Letters Patent No. 692,623, dated February 4, 1902.

Application filed December 7, 1900. Serial No. 38,992. (No model.)

To all whom it may concern:

Be it known that I, ALFRED CLARK, a citizen of the United States, residing at Paris, France, have invented certain new and useful Improvements in Seals for Phonographic Records, of which the following is a specification.

The object of this invention is to provide a seal upon a phonographic record in order that such records may be placed on sale and protected against use, so as to prevent them from being injured thereby.

Each time that a phonographic record is used to reproduce the sounds recorded on it the irregularities in the record-groove corresponding to the sound-waves are partially destroyed and the record is to that extent injured. To prevent this, I provide a seal, which may form a part of the record-blank or be attached thereto, the object being to so apply such seal to the phonographic record so that it must be broken or destroyed by the act of placing the record upon the phonograph.

My invention is shown applied to disks. When applied to flat disks, I may embed an irregular square of paper over the central aperture, so as to be flush with the surface of the disk, and cause a design or trade-mark to be imprinted thereon, so that the paper would have to be punctured when the record is placed upon the machine for use. This paper may be embedded in the disk, preferably on its lower side, in the process of manufacture.

In the drawings which accompany this specification, Figures 1 and 2 show my invention applied thereto. Fig. 1 represents a disk having an irregular square of paper embedded therein, so as to cover the central aperture. Fig. 2 is a side elevation of the same.

Like letters of reference indicate similar parts throughout the drawings.

a represents a flat disk of a material suitable for a phonograph or other talking-machine record.

d represents an irregular square of paper placed upon or embedded in the disk *a*, so as to cover the central aperture *c* during or after its process of manufacture.

I use the word "phonographic" in a broad sense as applying to all kinds of machines for recording and reproducing sounds.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is—

A phonographic record having a seal embedded therein or placed thereon to cover the central aperture so that it must be punctured by the act of placing the record in use upon the machine, substantially as described.

In testimony whereof I, ALFRED CLARK, have signed my name to this specification, in the presence of two subscribing witnesses, this 3d day of December, 1900.

ALFRED CLARK.

Witnesses:

FREDK. C. FISCHER,
HARRY G. WALTERS.



No. 692,624.

Patented Feb. 4, 1902.

A. CLARK.
SEAL FOR PHONOGRAPHIC RECORDS.

(Application filed Apr. 22, 1901.)

(No Model.)

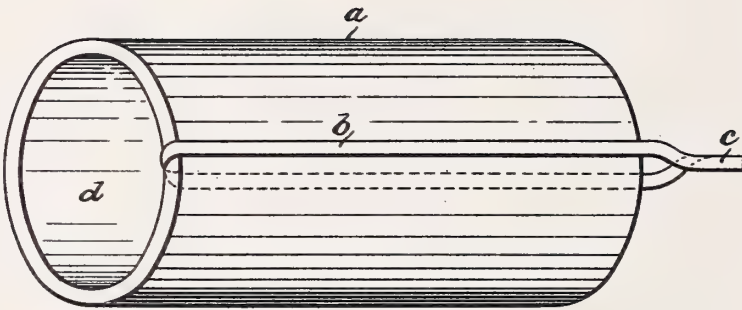


Fig. 1.

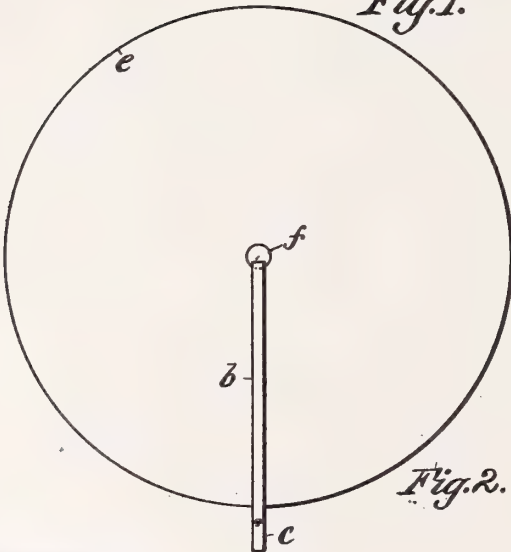


Fig. 2.



Fig. 3.

Witnesses
J. Fred Wherry

Inventor
Alfred Clark.
By his Attorney *Frank C. Fischer.*

UNITED STATES PATENT OFFICE.

ALFRED CLARK, OF PARIS, FRANCE.

SEAL FOR PHONOGRAPHIC RECORDS.

SPECIFICATION forming part of Letters Patent No. 692,624, dated February 4, 1902.

Application filed April 22, 1901. Serial No. 56,829. (No model.)

To all whom it may concern:

Be it known that I, ALFRED CLARK, a citizen of the United States, residing at Paris, France, have invented certain new and useful Improvements in Seals for Phonographic Records, of which the following is a specification.

The object of this invention is to provide a seal upon a phonographic record in order that such records may be placed on sale and protected against use, so as to prevent them from being injured.

Each time that a phonographic record is used to reproduce the sounds recorded on it the irregularities in the record-groove corresponding to the sound-waves are partially destroyed and the record is to that extent injured. To prevent this, I provide a seal which may be attached to the record, the object being so to apply such seal to the phonographic record that it must be broken or destroyed by the act of placing the record upon the phonograph.

My invention as illustrated is applied to cylinders and to disks, and when so applied the seal may be so attached thereto by means of a tape or other suitable fabric passing through the bore of the cylinder or through the central or other aperture of the disk and having its ends joined by means of wax or its equivalent.

In the drawings which accompany this specification, Figures 1, 2, and 3 show my invention applied thereto. Fig. 1 represents a cylinder having a tape passing through the central opening and having the ends joined

and secured by wax or its equivalent. Figs. 2 and 3 represent a disk having a tape or similar material passing through the central aperture and having the ends joined and secured by wax or its equivalent.

Like letters of reference indicate similar parts throughout the drawings.

a represents a cylindrical phonographic record having the tape or other suitable fabric passed through its bore *d* and having its ends sealed at *c*.

e represents a flat disk of a material suitable for a phonograph or other talking-machine record.

b indicates a tape or other suitable fabric passed through the central aperture *f*.

I use the word "phonographic" in a broad sense as applying to all kinds of machines for recording and reproducing sounds.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is—

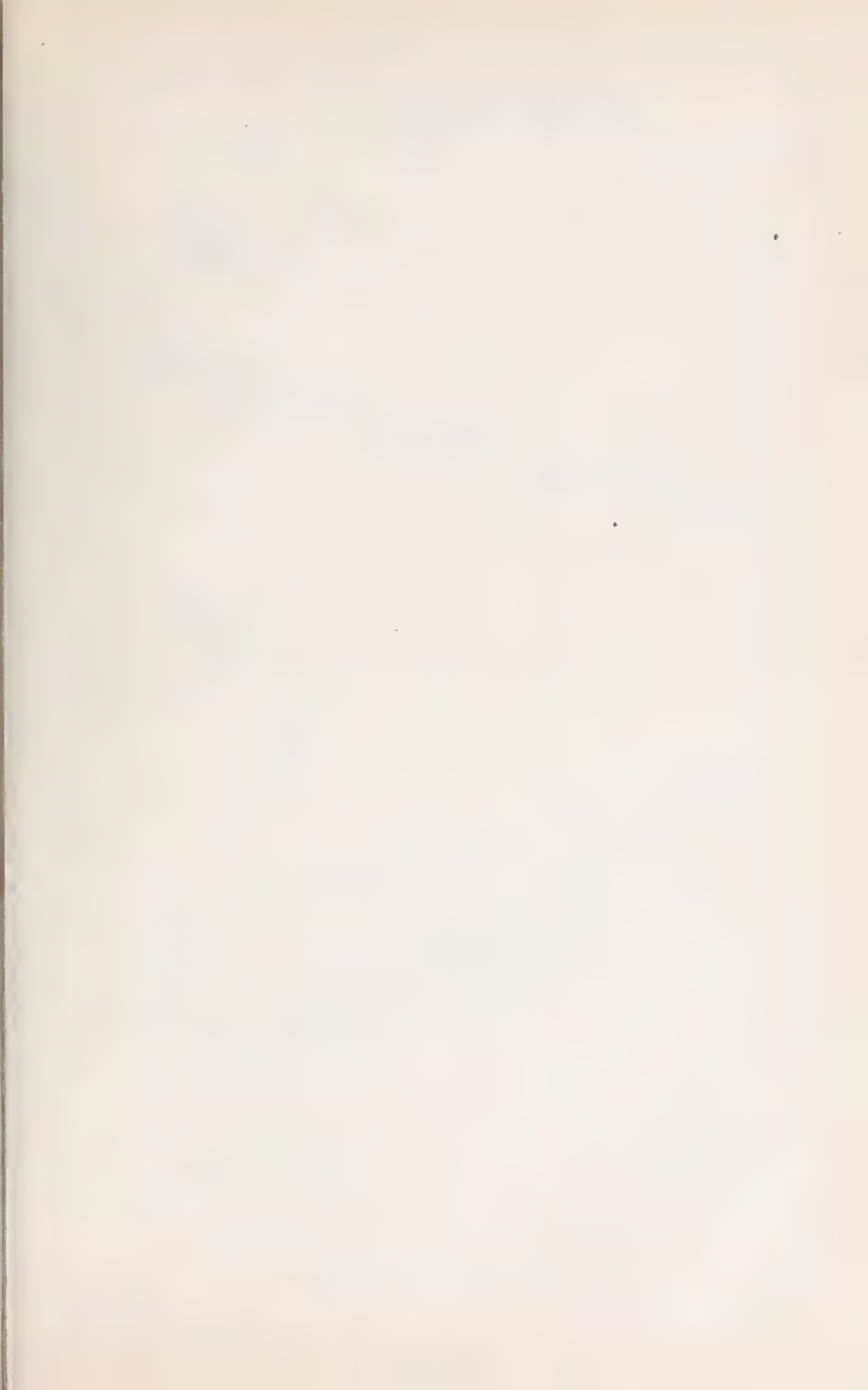
A phonographic record having a seal-shackle passed through its central bore or aperture and having its ends united and sealed by wax or its equivalent, substantially as described.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 9th day of April, 1901.

ALFRED CLARK.

Witnesses:

EDWARD P. MACLEAN,
GEORGE E. LIGHT.



No. 673,396.

Patented May 7, 1901.

G. L. HOGAN.

HORN OR TRUMPET FOR PHONOGRAPHS.

(Application filed May 28, 1900.)

(No Model.)

2 Sheets—Sheet 1.

Fig. 1.

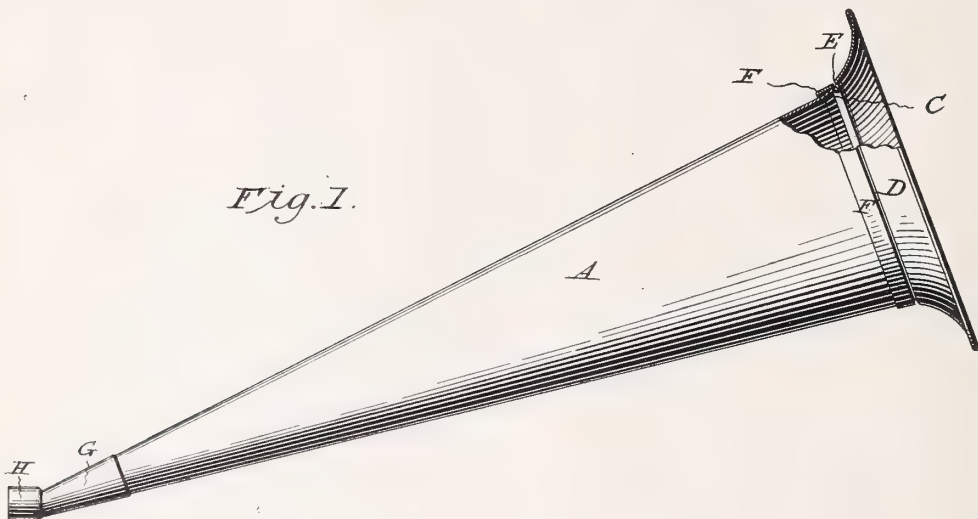
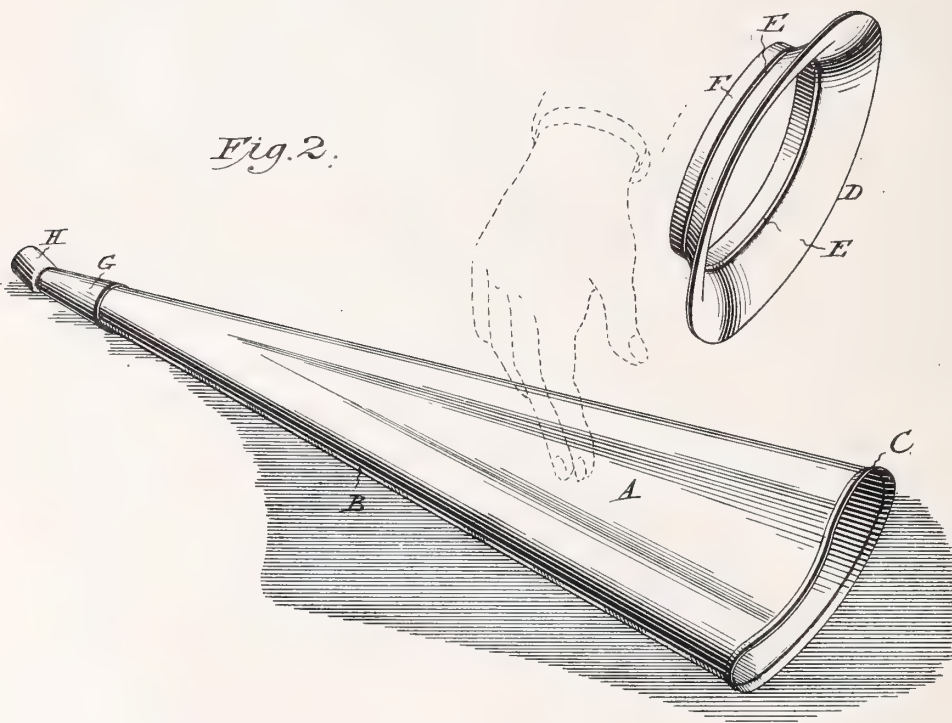


Fig. 2.



WITNESSES

J. B. Malnate,
D. E. Purdue

INVENTOR:

George L. Hogan,
by Dodge and Sons,
Attorneys.

No. 673,396.

Patented May 7, 1901.

G. L. HOGAN.

HORN OR TRUMPET FOR PHONOGRAPHS.

(No Model.)

(Application filed May 28, 1900.)

2 Sheets—Sheet 2.

Fig. 3.

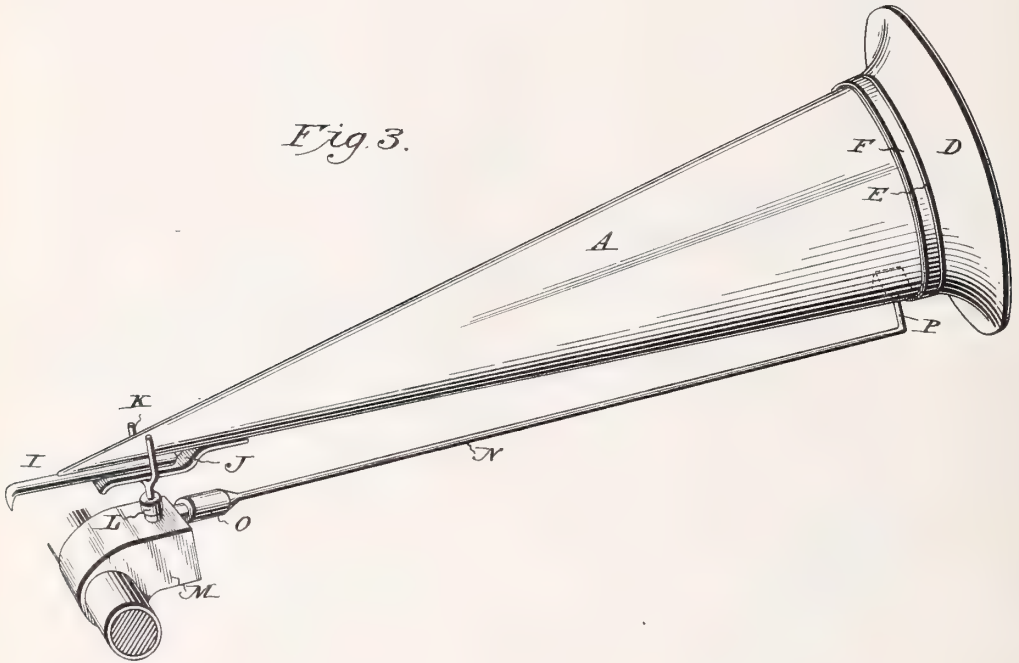


Fig. 4.

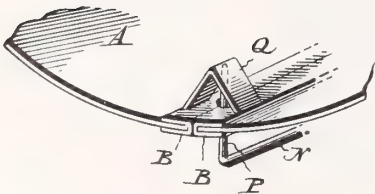
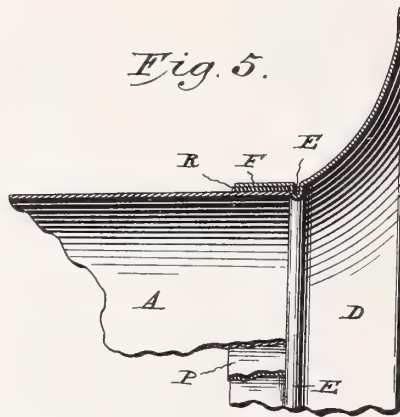


Fig. 5.



WITNESSES

J. B. Malnati,
D. E. Burdick.

INVENTOR:

George L. Hogan,
by Dodge and Son,
Attorneys.

UNITED STATES PATENT OFFICE.

GEORGE L. HOGAN, OF NEW YORK, N. Y.

HORN OR TRUMPET FOR PHONOGRAPHS.

SPECIFICATION forming part of Letters Patent No. 673,396, dated May 7, 1901.

Application filed May 28, 1900. Serial No. 18,282. (No model.)

To all whom it may concern:

Be it known that I, GEORGE L. HOGAN, a citizen of the United States, residing at New York city, in the county of New York and State of New York, have invented certain new and useful Improvements in Horns or Trumpets for Phonographs, of which the following is a specification.

My present invention pertains to phonographs, and more particularly to the trumpet used in connection therewith, as will be best understood upon reference to the accompanying drawings, wherein—

Figure 1 is a perspective view of the trumpet partly broken away; Fig. 2, a similar view showing the bell or collar removed and the body of the trumpet in a flattened or collapsed condition; Fig. 3, a perspective view of the trumpet, illustrating a method of supporting the same in connection with a phonograph, a stylus or reproducing-point being also shown; Fig. 4, a detail perspective view, and Fig. 5 a sectional view illustrative of a modified form of construction.

The main object of my invention is to produce a highly superior trumpet for use in conjunction with phonographs and the like, one which is highly resonant, light, clean, resilient, and collapsible, so that it may be packed away in a small space, and which also possesses other properties and qualities herein-after set forth.

A further object of my invention is to provide the horn so formed with means for bringing it into operative connection with a record.

The body or main portion of the trumpet is composed of a sheet of celluloid, isinglass, gelatin, or the like—in practice celluloid having been the substance employed—the sheet being so cut that when its edges are brought together it takes the desired shape. To secure the edges together, each edge is provided with a binding-strip B, preferably of sheet metal, and the two metal strips soldered together. The outer or larger end of the trumpet thus made is slightly flared, as indicated at C, Figs. 1 and 2. A collar or bell D, of sheet metal, is employed to form the finish or outer end of the trumpet, and said bell is provided with an inwardly-projecting ridge or rib E, intermediate the curved or flaring portion of the bell, and a rearwardly-extending sleeve F. In

practice the bell or collar is formed of a single piece of thin sheet metal, and when it is desired to place the same in position all that it is necessary to do is to pass the smaller end of the trumpet back through the opening in the bell or collar and draw the trumpet until the flared edge C bears upon the inner face of the collar F in rear of the rib E. The parts are so proportioned that the collar F and the flared edge C of the trumpet will make a tight fit one with the other. Owing to the fact that the collar F is also slightly smaller at its rear end or edge than near the bead or rib E, the celluloid makes a tight fit therewith, and the bell will not under ordinary usage become displaced. When, however, it is desired to withdraw the bell, it is only necessary to give it a quick forward pull.

The rear end of the trumpet in the forms shown in Figs. 1 and 2 is not closed—that is to say, the sheet is so shaped that when the edges are brought together an opening will be left at the smaller end. Over this smaller end is passed a hollow metal sleeve G, having secured thereto or formed integral therewith a collar H, which is adapted to be secured to the reproducer of any phonograph or similar machine. To maintain the sleeve in its position upon the trumpet-body, it is preferably soldered to the binding-strips B. The trumpet thus formed may when the bell D is removed be collapsed or folded up, as indicated in Fig. 2, and packed in a flat box or similar receptacle, occupying but little space. As above pointed out, the construction is advantageous in that the trumpet is light and needs no support when directly connected to the reproducer.

It is found in practice that the sound given off by a trumpet constructed as herein set forth is devoid of that well-known metallic ring or harshness common in other trumpets. Where the trumpet is used both for making the record and for giving it out, the effect is still more noticeable. It is to be observed that the body of the trumpet will not dent, is smooth, and consequently gives off a better tone than other trumpets which while apparently having a smooth surface of necessity have more or less imperfections. The trumpet can be folded or collapsed, is light, and no support is necessary therefor. It is

easy to keep clean and may be made highly ornamental by reason of variation in color and design. It is further to be noted that a trumpet made of this material may be manufactured at much less cost than can a trumpet made of metal.

In Fig. 3 a trumpet having its body portion made up in the manner above set forth is shown, except that instead of placing a sleeve or collar upon the rear end thereof to form connection with the ordinary reproducer there is illustrated a reproducing-stylus I, held in position upon the trumpet by being placed intermediate the binding-strips B, and a spring-arm J, soldered or otherwise secured to said binding-strips. The stylus is adapted to work in conjunction with the sound-record without the intervention or use of a reproducer, as is well understood. To maintain the trumpet and stylus in proper relation to the record, a forked member K is employed, said member having secured to its lower end a ferrule L, which passes over a stud extending up from the traveling block M, as is usual in the ordinary phonograph. Said stud usually holds in place the reproducer now commonly used. To maintain the outer end of the trumpet in its elevated position, a supporting-rod N, having attached to its rear end a ferrule O, is employed. The ferrule fits over a stud extending outwardly from the block M, as is usual. The outer end of the rod N is bent upwardly, forming a point P, which extends through an opening formed in the binding-strips B and bears against a U-shaped metal plate Q, secured inside of the trumpet to the binding-strips B. The opening through which the arm or upward extension P passes is made sufficiently large so that the arm will not come in contact with the walls thereof—this for the reason that it is desirable that the trumpet should have a perfectly free movement, so that the stylus may adapt itself to the variation in the record-surface.

It is manifest that a trumpet built up in the manner herein set forth may be employed in connection with any form of stylus or reproducing device, and I do not therefore desire to limit myself to any particular form.

In Fig. 5 there is illustrated a bell or flare having its rearwardly-extending sleeve F provided with a lining R, of rubber, against which the celluloid forming the body of the trumpet may bear. This construction may be employed instead of flaring the outer end of the celluloid body and is designed to form a close union between the parts. In practice, however, it has been found that neither the flare nor the rubber packing is essential to a proper joining of the parts, as the celluloid may be made perfectly straight, as indicated in Fig. 5, and bear directly against the collar F, the edge coming in rear of the rib or bead.

While I have described the trumpet as made up of a sheet of celluloid or similar material having its edges bound or secured to-

gether, I desire to be understood as claiming, broadly, a trumpet composed of the material herein set forth, whether said trumpet be made of a single sheet having its edges joined together or molded, so that there are no joints in it whatsoever.

Although it is desirable to use the flare or member D, it is not absolutely essential so to do, inasmuch as when the trumpet-body is formed either by bringing its edges together or by molding it will maintain its shape to a greater or less degree. Of course when the bell is passed over the trumpet-body and brought to position on the end the trumpet assumes a more perfect shape and the forward edge is also protected.

Having thus described my invention, what I claim is—

1. A trumpet for phonographs and the like formed of a sheet of resilient celluloid having its edges brought together and permanently secured, and means for maintaining the outer end of the trumpet in shape.

2. A trumpet for phonographs or the like formed of a sheet of resilient material, and a collar removably mounted upon the outer or larger end of the trumpet.

3. A trumpet for phonographs or the like formed of resilient material, and a collar removably mounted upon the outer end of the trumpet, said collar having an inwardly-extending bead.

4. A trumpet for phonographs and the like, comprising a body portion formed of resilient material; a flare or collar having an inwardly-extending bead, mounted upon the large end of the trumpet; and means carried by the other end of the trumpet adapted to bring the trumpet into operative relation with the sound-record of a phonograph.

5. A trumpet for phonographs and the like, comprising a body portion formed of resilient material; a removable flare mounted upon the outer end of the trumpet; and means carried at the opposite end of the trumpet adapted to bring the trumpet into operative relation with the sound-record of a phonograph.

6. A trumpet for phonographs formed of a sheet of resilient material having its edges permanently connected, whereby the trumpet may be folded or collapsed and when relieved from pressure or restraint will assume its normal shape.

7. A trumpet for phonographs or the like formed of a single piece of flexible resilient material capable of being folded or collapsed upon itself while still retaining its integrity of structure whereby the trumpet may be folded upon itself when desired, and will resume its normal position and form when released from confinement.

8. A trumpet for phonographs or the like formed of a flexible resilient material, and provided with a removable means for maintaining it in shape when in use.

9. A trumpet for phonographs or the like formed of a flexible springy material, and

provided with removable means for maintaining its outer end in shape when in use.

5 10. A trumpet for phonographs or the like formed of a flexible springy material; means secured to the smaller end thereof adapted to bring it into operative relation with a sound-record; and a removable flare or collar mounted upon the outer end of the trumpet.

10 11. A trumpet for phonographs or the like having its body portion formed of resilient material, the outer or larger end being flared outwardly; and a removable flare or collar mounted upon said flared end.

12. A trumpet for phonographs or the like having its body formed of a sheet of resilient 15 celluloid; a metallic binding for the proximate edges thereof; a ferrule secured to the smaller end of the trumpet; and a removable flare mounted upon the opposite end.

In testimony whereof I have signed my 20 name to this specification in the presence of two subscribing witnesses.

GEORGE L. HOGAN.

Witnesses:

JAS. W. WALKER, Jr.,
MILLARD F. KUH.

No. 694,705.

Patented Mar. 4, 1902.

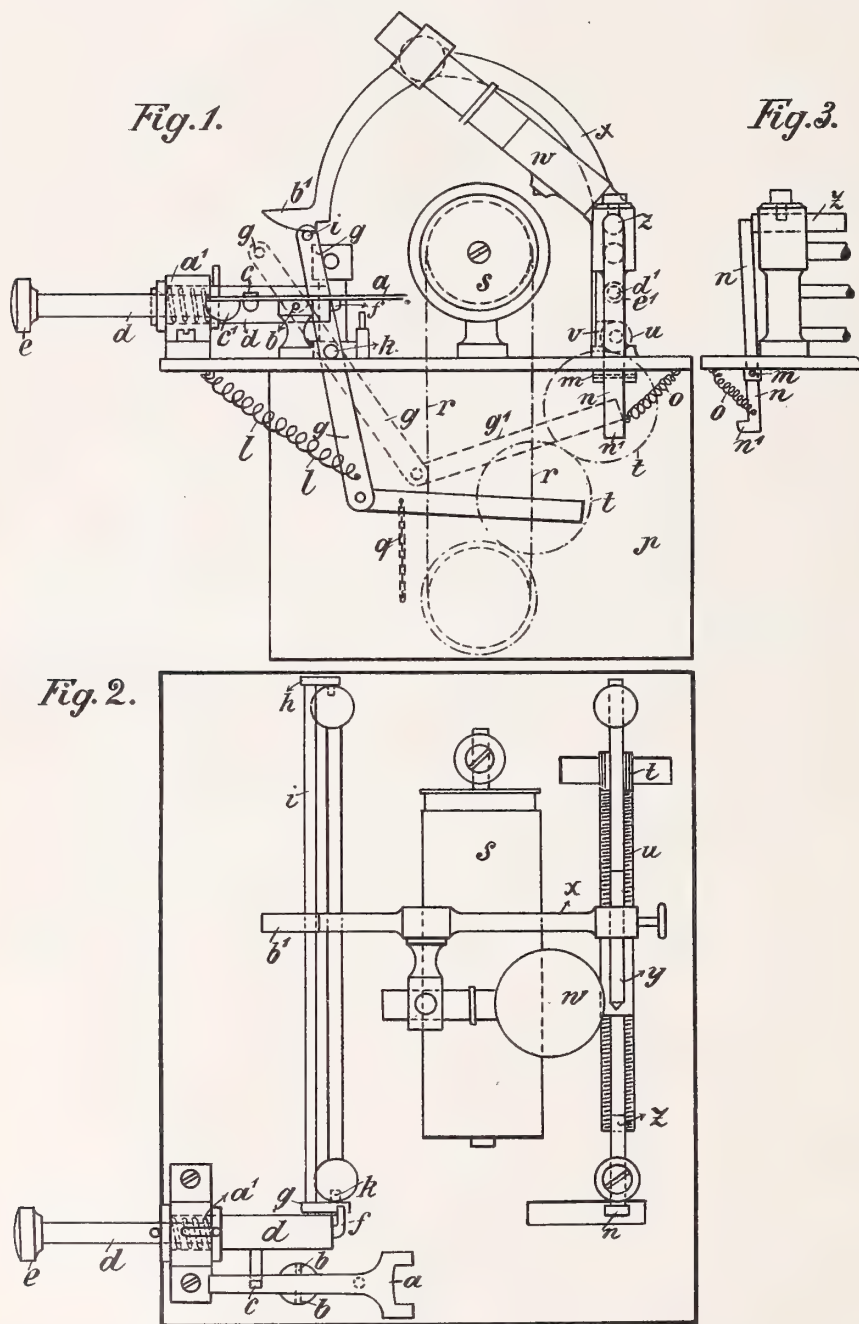
J. WALL.

AUTOMATIC RELEASING MECHANISM FOR PHONOGRAPHS, &c.

(Application filed Nov. 9, 1900.)

(No Model.)

2 Sheets—Sheet 1.



Witnesses:
Wilhelm Vogt
Henry E. Ewending.

Inventor:
Julius Wall,
J. Walter Dwyer
Attorneys.

No. 694,705.

Patented Mar. 4, 1902.

J. WALL.

AUTOMATIC RELEASING MECHANISM FOR PHONOGRAPHS, &c.

(Application filed Nov. 9, 1900.)

(No Model.)

2 Sheets—Sheet 2.

Fig. 4.

Fig. 5.

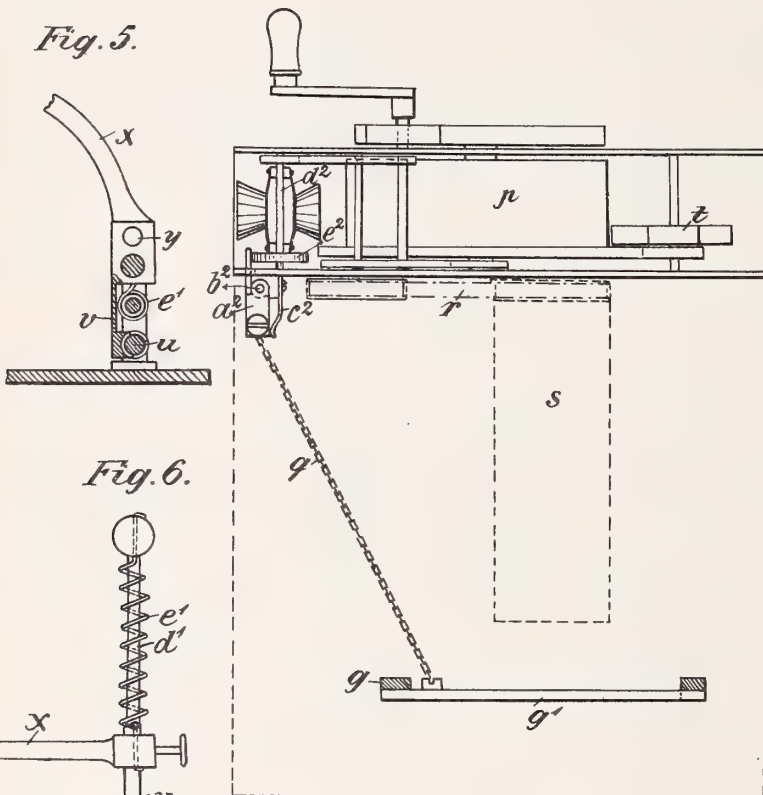
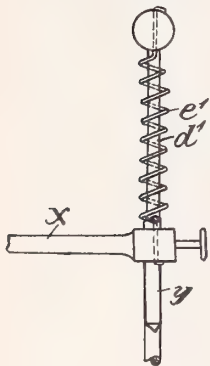


Fig. 6.



Witnesses:
Wilhelm Vogt
Thomas M. Smith.

Inventor:
Julius Wall,
by J. Walter Douglas,
Attorney.

UNITED STATES PATENT OFFICE.

JULIUS WALL, OF BERLIN, GERMANY.

AUTOMATIC RELEASING MECHANISM FOR PHONOGRAPHS, &c.

SPECIFICATION forming part of Letters Patent No. 694,705, dated March 4, 1902.

Application filed November 9, 1900. Serial No. 35,946. (No model.)

To all whom it may concern:

Be it known that I, JULIUS WALL, a citizen of the United States of America, residing in Berlin, in the Empire of Germany, (whose post-office address is 46-47 Landsbergerstrasse, Berlin,) have invented certain new and useful Improvements in Automatic Releasing Mechanisms for Phonographs and the Like, of which the following is a specification.

10 This invention has relation to an automatic releasing mechanism for phonographs; and in such connection it relates to the construction and arrangement of such a mechanism.

The principal object of my invention is to
15 provide in a phonograph a draw-bar, a lever adapted to be operated when said draw-bar is pulled in one direction, an arm controlled by said lever, a sound box or carrier adapted to descend upon the operation of the lever, a
20 clockwork mechanism adapted to be set in operation upon one movement of the arm, a driving-worm and drum controlled by the clockwork, means for coupling the sound box or carrier to the driving-worm when the
25 carrier descends, a record secured to the drum and adapted to be engaged by the reproducing mechanism of the sound-box, a hook adapted to retain the lever and its arm in operative position, a stop traveling with
30 the sound-box carrier and adapted to release the hook at the completion of the movement longitudinally of said carrier, and a spring adapted to return the lever and arm to normal inoperative position when said hook is
35 released and to elevate the sound-box carrier away from the drum and record.

The nature and scope of my invention will be more fully understood from the following description, taken in connection with the accompanying drawings, forming part hereof, in which—

Figure 1 is a side elevational view of a phonographic apparatus embodying main features of my invention. Fig. 2 is a top or
45 plan view of Fig. 1. Fig. 3 is a detail view of the locking mechanism for securing the starting-lever mechanism in elevated position. Fig. 4 is a top or plan view illustrating the lever mechanism in conjunction with the
50 clockwork. Fig. 5 is a sectional view illustrating the driving shaft or drum, and Fig.

6 is a detail view of the connection between the spring and the sound-box slide or carrier.

Referring to the drawings, the apparatus consists of a lever *a*, pivotally secured, as at *b*, 55 to the framework of the machine. The lever *a* has at one end an opening adapted to receive a bolt or pin *c* and carries at that end a counterweight *c'*. A draw-bar *d* is provided with a button *e* and hook *f* and is normally under 60 tension of a spring *a'*. The lever *g* is pivotally secured, as at *k*, to the framework of the phonograph and carries an arm *g'*. The lever *g* and a lever *h* both carry a rod *i*. The lever *g* is under the influence or tension of a spring 65 *l*. A lever *n*, under tension of the spring *o*, is pivoted to the framework, as at *m*, and carries the hook *n'*. The clockwork *p* is located in a housing below the phonograph proper and is started by the cord *r* and wheels *t*. 70 The cord *r* actuates the drum *s* and the wheels *t* actuate the worm *u*. The worm *u* is engaged by a nut *v*, secured to the sound-box carrier *x*. The stop *y*, normally pressing against a stop *z*, is also carried by the mem- 75 brane or sound-box carrier *x*, which carrier *x* is under the influence of a spring *c'*. The lever *g*, by means of a chain *q*, is connected with a brake-lever *a''*, which controls the clockwork *p*, and when elevated starts said clock- 80 work. The clockwork *p* stops upon the descent of the lever *g*.

The operation of the mechanism is as follows: A coin sliding through a passage impinges upon a lever *a* and causes the latter 85 to tilt upon an axis or fulcrum *b* and to thereby free or clear a pin *c*. This pin *c* is mounted upon a draw-bar *d*, which can be drawn outward by means of the button *e* when its pin *c* is clear of the lever *a*. The draw-bar 90 *d* is provided at its inner end with a hook *f*, engaging a lever-arm *g*, pivoted on the pin *k*. The pin *k*, in conjunction with a lever *h*, carries a cross-bar *i*. A spring *l* tends normally to retract the lower end of the 95 lever *g* and to depress the arm *g'*, connected thereto. The arm *g'* in moving upward against the tension of the spring *l* presses back a lever *n*, fulcrumed or pivoted, as at *m*, against the tension of a spring *o*. A hook 100 *n'* on the end of the lever *n* serves to lock the arm *g'* in its elevated position. The arm *g'*

is connected by a chain q with a clockwork or similar motor p . A spring c^2 (see Fig. 4) presses the brake-lever a^2 against a brake-disk e^2 , located on the controlling or governor shaft d^2 for the motor p when the arm g' is in its lowermost or inoperative position, and hence in the normal position of the lever a and arm g' the motor p is inoperative. This chain q is connected with the brake-lever a^2 , which is under tension of the spring c^2 and is pivotally secured, as at b^2 , (see Fig. 4,) to the framework of the machine. When, however, the lever g is shifted by the draw-bar d to elevate the arm g' into locked connection with the lever n and its hook n' , as illustrated in dotted lines in Fig. 1, the brake a^2 is released by the chain q from the disk e^2 and the motor p is permitted to operate. The clockwork-motor p operates the phonograph cylinder or drum s by means of a belt or band r , and the motor p also operates a screw-shaft u by means of gears t . The screw or driving shaft u is connected by a nut v with the slide or carrier x , which carries the membrane or sound-box w . (See Figs. 2 and 5.) This carrier x has been lowered by the movement of the lever g outward, since the upper end of said lever g slides from under the beveled projection b' on the free end of said carrier x . When the carrier x is lowered, the sound box or receiver w is brought into operative position, with the record placed upon the drum or cylinder s . When the sound-box w has traversed the record, a pin y on the carrier x impinges upon a catch z , which causes the lever n to retract its hook n' against the tension of the spring o away from the arm g' . This arm g' when released is depressed by the spring l , and its lever g is forced inward to elevate the projection b' and carrier x away from the drum s . The draw-bar d is normally forced inward when the lever g returns to its normal position by means of a spring a' . At the same time the lever a , by means of a counterweight e' , falls to its normal position to bring the pin c in locking engagement with the draw-bar d and prevent its withdrawal until another coin is placed in the apparatus. When the car-

rier x for the sound-box w descends, the nut v engages firmly the driving screw-shaft u , and the carrier is moved forward by said shaft. When, however, the carrier x is elevated by the lever-arm g , the nut v is released from the shaft u , and a spiral spring e' , mounted upon the rod d' , returns the carrier x to its normal position. The spring e' is fastened at one end to the framework of the apparatus and at the other end to the carrier and is extended by the movement of the carrier along the shaft u . When the arm g' and lever g assume a normal position, the chain q is slackened to permit the brake a^2 to impinge upon the disk e^2 and to stop the motor p .

Having thus described the nature and object of my invention, what I claim as new, and desire to secure by Letters Patent, is—

In a phonograph, a draw-bar, a lever adapted to be operated when said draw-bar is pulled in one direction, an arm adapted to be elevated by said lever, a sound box or carrier adapted to descend when said lever is operated, a clockwork mechanism adapted to be set in operation when the arm is elevated, a driving-worm and a drum adapted to be set in motion by the clockwork, a coupling means adapted to connect the sound-box carrier to said driving-worm when the carrier descends, a record secured to the drum and adapted to be engaged by the sound-reproducing mechanism of the sound-box, a hook adapted to retain the lever and its arm in operative position, a stop traveling with the sound-box carrier and adapted to shift said hook at the completion of the longitudinal movement of the carrier, and a spring adapted to return the lever and its arm to normal inoperative position and to thereby elevate the sound-box carrier away from the drum and record.

In witness whereof I have hereunto signed my name, this 6th day of October, 1900, in the presence of two subscribing witnesses.

JULIUS WALL.

Witnesses:

SALLY SCHOENBERG,
HENRY HASPER.

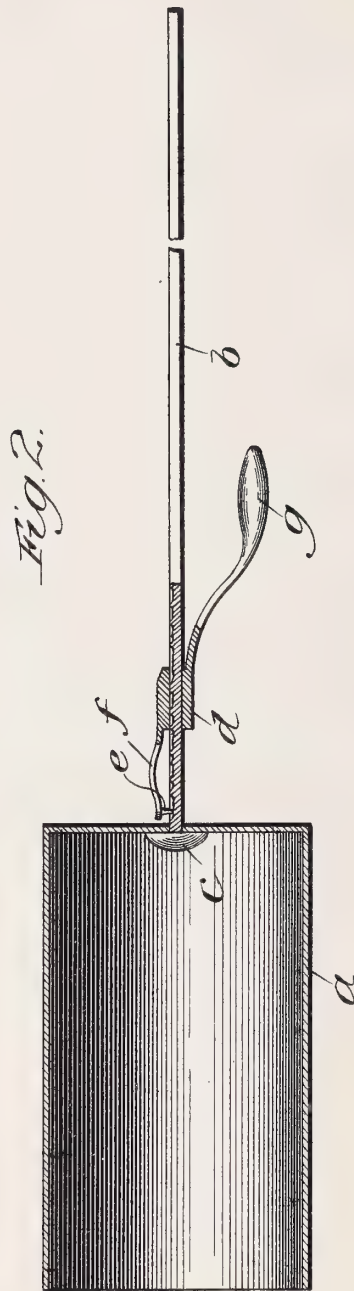
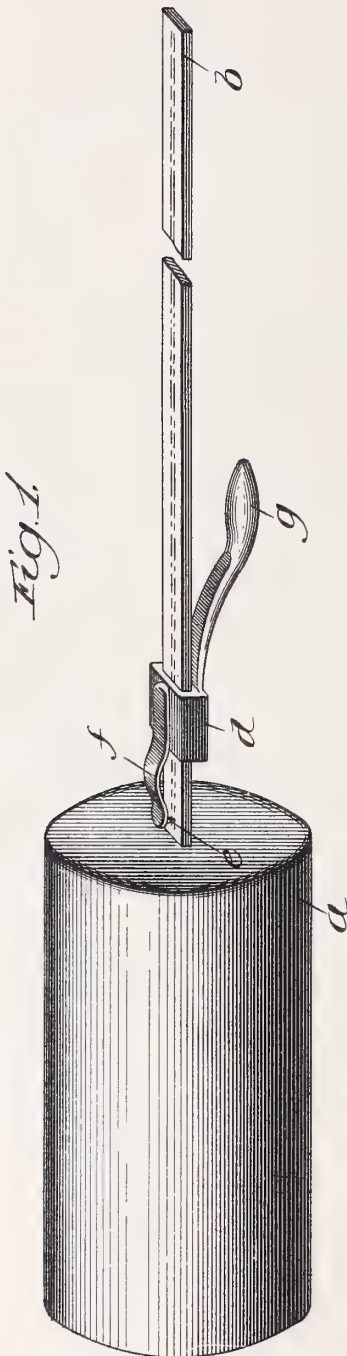
No. 695,159.

Patented Mar. 11, 1902.

T. B. LAMBERT.
APPARATUS FOR REPRODUCING SOUNDS.

(Application filed July 20, 1901.)

(No Model.)



Witnesses:
Chas. C. Gaylord.
Geo. L. Davison.

Inventor:
Thomas B. Lambert,
By *Thomas F. Sheridan,*
Att'y.

UNITED STATES PATENT OFFICE.

THOMAS B. LAMBERT, OF CHICAGO, ILLINOIS.

APPARATUS FOR REPRODUCING SOUNDS.

SPECIFICATION forming part of Letters Patent No. 695,159, dated March 11, 1902.

Application filed July 20, 1901. Serial No. 69,135. (No model.)

To all whom it may concern:

Be it known that I, THOMAS B. LAMBERT, a citizen of the United States, residing at Chicago, Illinois, have invented certain new and useful Improvements in Apparatus for Reproducing Sounds, of which the following is a specification.

This invention relates to that class of apparatus which is provided with elements on which sound-waves are recorded and which may be reproduced at will, and particularly to a class of apparatus that may be used in connection with toys, such as dolls and the like.

The principal object of the invention is to provide a simple, economical, and efficient apparatus for reproducing sound-waves.

A further object is to provide simple, economical, and efficient apparatus for the reproduction of sound-waves which may be used economically and satisfactorily with toys, such as dolls and the like. Further objects will appear from an examination of the drawings and the following description and claims.

The invention consists principally in the combination of a vibratable element having a sound-record thereon and a vibratable body or diaphragm attached thereto.

The invention consists, further, in the combination of a vibratable strip having a sound-record therein, a vibratable diaphragm attached thereto, and means for causing both the record-bearing portion and the diaphragm to vibrate in unison.

The invention consists, further, in the combination of a vibratable element having a sound-record thereon, a vibratable diaphragm attached thereto, and a stylus arranged to move thereon and contact the sound-record and vibrate it and the diaphragm in unison.

The invention consists, further and finally, in the features, combinations, and details of construction hereinafter described and claimed.

In the accompanying drawings, Figure 1 is a perspective view of one style of apparatus constructed in accordance with these improvements, and Fig. 2 a longitudinal sectional view of the same.

In the art to which this invention relates it is well known that it has long been desirable in the manufacture of toy dolls and the

like to obtain an economical, simple, and efficient talking apparatus which might be used in combination therewith and so arranged that by simple manipulation sound-waves could be reproduced to cause the sounding of articulate speech, trite sayings, and the like.

The principal object of this invention, therefore, is to provide such an apparatus or instrument, as will more fully hereinafter appear.

In constructing an apparatus in accordance with these improvements I prefer to provide a cup-shaped sounding-box *a* and make it of any desired material, such as papier-mâché, though it may be made of any number of materials—such as common cardboard, tin, metal of all descriptions, celluloid, aluminium, wood, or glass, depending upon the cost and facilities for producing such and the particular purposes for which they are adapted.

To reproduce the sound-waves, I provide what I term a "sound-curve strip" *b*, preferably rectangular in cross-section, and which is provided with a head portion *c*. This sound-curve strip is passed through a perforation in the head of the sound-box, so that they are to all intents and purposes connected together. This sound-curve strip may be formed of any one of a variety of materials; but I prefer to form it of some plastic material, such as celluloid or rubber. It is prepared by first making it in strips and then preliminarily softening or heating it to a softened state and then engraving or indenting the sound-curve thereon by any desired mechanism, either by the direct operation of the stylus attached to a vibrating diaphragm of an ordinary phonograph or under a roll which has been previously engraved with a sound-curve. The strip is then permitted to harden, after which it can be inserted in position, as shown in the drawings.

To reproduce the sound-waves, I prefer to use a slide-block *d* and mount it upon the sound-curve, as shown in the drawings. This sliding block is provided with a stylus *e*, secured to the sliding block by means of a spring *f* and in such position that the point of the stylus is always under the tension and in engagement with the sound-curve.

By moving the stylus backwardly and for-

wardly, either by means of the handle *g* on the sliding block or the finger, the sound-curve and the diaphragm are caused to vibrate in unison, and according as the sound-curve is engraved the sound reproduced is the same as that originally recorded on the curve.

The words "vibratable strip" as used in the claims are defined and intended to mean a material substance capable of being caused to vibrate.

I claim—

1. In an apparatus of the class described, the combination of a vibratable strip having a sound-record thereon, a sound-curve, and a vibratable body attached thereto, substantially as described.

2. In an apparatus of the class described, the combination of a vibratable strip having a sound-record thereon, a sound-curve, and a vibratable body adapted to vibrate in unison therewith attached thereto, substantially as described.

3. In an apparatus of the class described, the combination of a vibratable strip having a sound-record thereon, a sound-curve, a vibratable body attached thereto, and means for causing the record and vibratable body to vibrate in unison, substantially as described.

4. In an apparatus of the class described, the combination of a vibratable strip having a sound-record thereon, a sound-curve, a vibratable diaphragm attached thereto, a sliding block slidably mounted on the record, and a spring-stylus mounted on such block engaging the sound-curve, substantially as described.

5. In an apparatus of the class described, the combination of a cup-shaped sounding-box provided with a perforation in the head thereof, and a sound-curve strip passed through such perforation, substantially as described.

6. In an apparatus of the class described,

the combination of a cup-shaped sounding-box having a perforation passed through its head portion, a sound-curve strip passed through such perforation and provided with a head loosely engaging the head of the sound-box, and a slide on the sound-curve provided with a spring-pressed stylus engaging the sound-curve, substantially as described.

7. In an apparatus of the class described, the combination of a vibratable strip having a sound-record thereon, and a body portion adapted to vibrate in unison therewith arranged at the end thereof, substantially as described.

8. In an apparatus of the class described, the combination of a vibratable resonant body portion, and a vibratable strip having a sound-record thereon connected with and extending at an angle from the surface of such body portion, substantially as described.

9. In an apparatus of the class described, the combination of a vibratable strip having a sound-record thereon embodying a line of sound-record indentations, and a vibratable resonant body portion attached thereto at a point beyond the end of the line of indentations, substantially as described.

10. In an apparatus of the class described, the combination of a vibratable strip having sound-record indentations extending longitudinally thereof, and a vibratable body portion attached thereto and adapted to vibrate in unison therewith, substantially as described.

11. In an apparatus of the class described, a vibratable strip portion having sound-record indentations extending longitudinally thereof, and a resonant body portion adapted to vibrate in unison with the record portion, substantially as described.

THOMAS B. LAMBERT.

Witnesses:

ANNIE C. COURTENAY,
HARRY IRWIN CROMER.



No. 695,272.

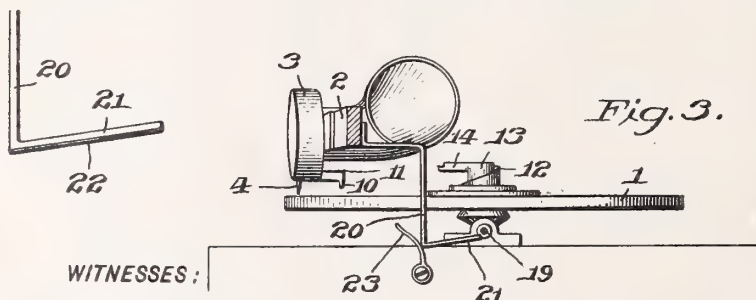
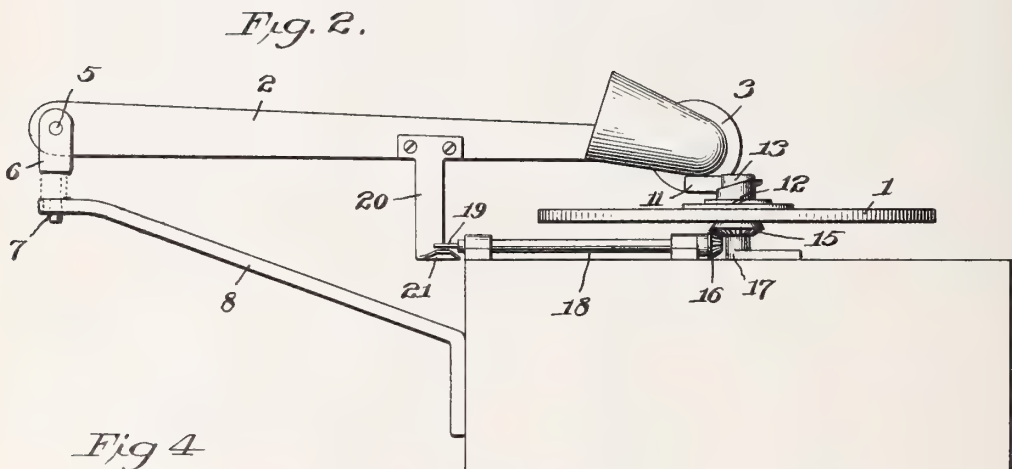
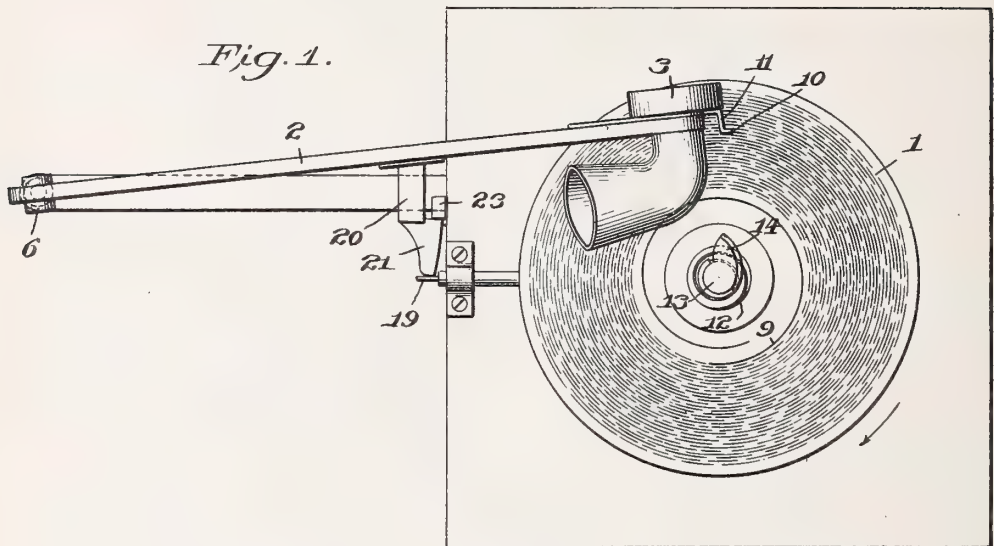
Patented Mar. 11, 1902.

J. J. BILLING.

REPEATING MECHANISM FOR PHONOGRAPHS.

(Application filed Nov. 5, 1901.)

(No Model.)



WITNESSES:
A. V. Group
Mae Hoffman

INVENTOR
John Jakob Billing
BY *Wm. C. S. Dale*
ATTORNEY

UNITED STATES PATENT OFFICE.

JOHN JAKOB BILLING, OF PHILADELPHIA, PENNSYLVANIA.

REPEATING MECHANISM FOR PHONOGRAPHS.

SPECIFICATION forming part of Letters Patent No. 695,272, dated March 11, 1902.

Application filed November 5, 1901. Serial No. 81,176. (No model.)

To all whom it may concern:

Be it known that I, JOHN JAKOB BILLING, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented a new and useful Repeating Mechanism for Graphophones, of which the following is a specification.

My invention relates to repeating mechanism for graphophones, my object being to provide automatic means for returning the needle after it has traversed the record back to the initial position.

Referring to the drawings, Figure 1 is a plan view of my device in the initial position—that is, the beginning of the record. Fig. 2 is a side view of same. Fig. 3 is an end view of same. Fig. 4 is a detail, slightly enlarged, of the shoe.

Similar numerals refer to similar parts throughout the several views.

1 represents the revolving record-table, the record-score being in a horizontal plan and in a spiral from the outer circumference toward the center. The arm 2, carrying the reproducer 3 and needle 4, is pivoted on a horizontal pivot 5 to post 6, which is in turn pivoted vertically at 7 to bracket 8, so that as the record-table 1 travels in the direction shown by the arrow in Fig. 1 the needle 4 is carried toward the center of the table to the end of the record-score. At the end of the record-score a continuing-groove 9 is provided in the surface of the record-table having an accentuated spiral which serves to carry the needle to the position toward the center of the table in which the point 10 of the extension 11 from the reproducer 3 coöperates with an inclined spiral groove 12 in post 13, which is rigidly secured to the record-table and adapted to rotate with it. This serves to raise the reproducer and needle out of engagement with the record-table. The groove 12 then extends outwardly along the arm 14 for the purpose hereinafter described. By the gear-wheels 15 and 16 beneath the record-table 1 motion is communicated from the driving-shaft 17 to the horizontal shaft 18, which terminates in an attenuated shaft 19. Secured to the arm 2, about midway its extremities, is the downwardly-extending member 20, carrying at its lower extremity an approximately

horizontal extension or shoe 21, having a laterally-extending offset from the plane of the part 20 toward the revolving table and provided at its under side with a suitable surface 22, such as rubber or leather, for frictional contact with the revolving shaft 19.

Referring to Fig. 2, it will be seen that when the needle is in the operative position in engagement with the record the lateral extension of the shoe 21 lies beneath the shaft 19 and travels entirely beneath said shaft 19 prior to the engagement of projection 10 with spiral incline groove 12. It is then raised by this spiral incline 12, the arm being raised, as above described, lifting the needle above the record and carrying the shoe 21 to an elevation above the revolving shaft 19. The point 10 then traveling along the groove 12 is carried outwardly to the end of the extension 14. This reverses the horizontal movement of the arm 2, so that when the point 10 leaves the groove 12 at the end of projection 14 the laterally-extending part of the shoe 21 is resting upon the revolving shaft 19, which by its frictional engagement with the surface 22 of projection 21 carries the arm back gradually to the initial position, so that when the extension 21 leaves the shaft 19, as shown in Fig. 1, the needle has been brought into a position to engage with the beginning of the record, the incline of projection 21 being nicely adjusted, so as to deliver the needle back to the record without unnecessary impact. A stop 23, preferably of incline resilient material, may be provided to positively limit the return movement of said needle and then permit it to slide quietly into position.

What I claim is—

1. In a repeating mechanism for graphophones a lifting device provided with a spiral incline groove rotatable with the record-table and a projection connected with the reproducer adapted to engage in said spiral incline groove for lifting the reproducer-needle from engagement with the record-table.

2. In a repeating mechanism for graphophones a centrally-located projection from the record-table provided with a spiral incline groove, said groove first contracting and then expanding, and a projection connected with the reproducer adapted to engage with said groove to lift the reproducer-needle from

engagement with the record-table and reverse the horizontal movement of said reproducer.

3. In a repeating mechanism for graphophones a centrally-located projection from the record-table provided with a spiral incline groove, said groove first contracting then expanding, a projection connected with the reproducer adapted to engage with said groove to lift the reproducer-needle from engagement with the record-table and reverse the horizontal movement of said reproducer, and frictional means for carrying the reproducer back to the initial position after it leaves said spiral incline groove.

4. In a repeating mechanism for graphophones the combination of a spiral groove in the record-table for cooperating with the needle to continue the movement of the reproducer toward the center of the record-table, a centrally-located post rotatable with the record-table provided with a spiral groove first ascending and contracting then expanding horizontally, a projection connected with the reproducer adapted to engage with said groove to lift the reproducer from the record-table and change its direction of motion, a shoe connected with the reproducer-supporting means and a rotatable shaft adapted to cooperate with the shoe to complete the return movement of the reproducer to the initial position.

5. In a repeating mechanism for graphophones the combination of a lifting device provided with a spiral incline contracting and expanding groove centrally located and rotatable with the record-table, a projection connected with the reproducer for cooperating with said groove a rotatable shaft and an arm connected with the reproducer-supporting

means having frictional engagement with the rotatable shaft.

6. In a graphophone having a horizontal plano-surface record-table, a spirally-grooved post centrally disposed and rotatable with said table, said spiral groove first contracting then expanding, a reproducer-supporting arm, a projection connected therewith to cooperate with the spiral groove, a rotatable shaft and means for communicating motion thereto in connection with the movement of the table and a member connected with the reproducer-supporting arm having frictional engagement with the rotatable shaft after the disengagement of the cooperating projection and spiral groove, substantially as described.

7. In a repeating mechanism for graphophones a rotatable shaft driven by the record-driving mechanism, a friction-shoe connected to the reproducer-supporting arm to cooperate with said rotatable shaft and automatic means for lifting the reproducer out of engagement with the record-table and for carrying the friction-shoe into cooperation with the rotatable shaft.

8. In a repeating mechanism for graphophones a rotatable shaft driven by the record-driving mechanism, a friction-shoe connected to the reproducer-supporting arm to cooperate with said rotatable shaft and automatic means for lifting the reproducer out of engagement with the record-table and for carrying the friction-shoe into cooperation with the rotatable shaft, and an inclined resilient stop to limit the return movement of the reproducer and to guide it into the initial position.

JOH. JAKOB BILLING.

Witnesses:

JOHN THIEL,
MAE HOFMAN.

No. 695,883.

Patented Mar. 18, 1902.

J. F. LUSCOMB.

MEANS FOR REGULATING THE TENSION OF DIAPHRAGMS OF SOUND PRODUCING INSTRUMENTS.

(Application filed May 16, 1901.)

(No Model.)

Fig. 1.

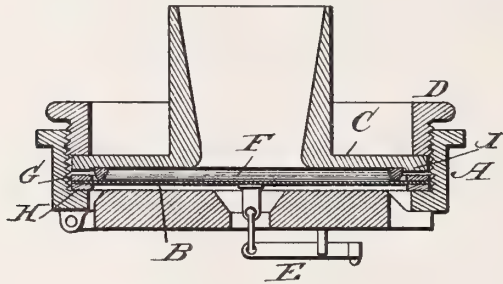


Fig. 2.

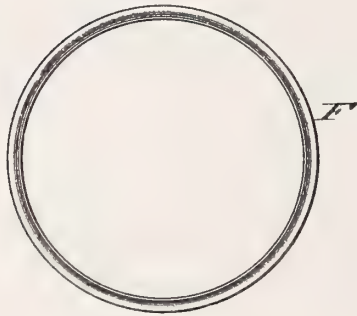
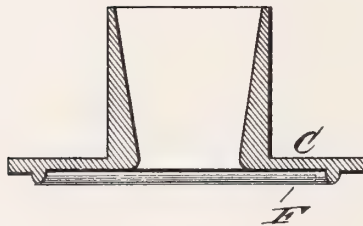


Fig. 3.



Witnesses
Gordon S. Balt,
Wm. M. Wood,

Inventor
John F. Luscomb,
By *Chas. W. Fowler*
Attorney

UNITED STATES PATENT OFFICE.

JOHN F. LUSCOMB, OF BOSTON, MASSACHUSETTS.

MEANS FOR REGULATING THE TENSION OF DIAPHRAGMS OF SOUND-PRODUCING INSTRUMENTS.

SPECIFICATION forming part of Letters Patent No. 695,883, dated March 18, 1902.

Application filed May 18, 1901. Serial No. 60,440. (No model.)

To all whom it may concern:

Be it known that I, JOHN F. LUSCOMB, a citizen of the United States, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Means for Regulating the Tension of Diaphragms of Sound-Producing Instruments; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the annexed drawings, making a part of this specification, and to the letters of reference marked thereon.

The present invention has for its object to provide means for regulating the tension of the diaphragm of sound recording, reproducing, and transmitting instruments, such as phonographs, gramophones, graphophones, and similar instruments where a reproducer-diaphragm is employed; and it consists in the means substantially as shown in the drawings and hereinafter described and claimed.

Figure 1 of the drawings is a sectional elevation of a reproducer-head embodying my invention; Fig. 2, a plan view of the compressor-ring; Fig. 3, a sectional elevation of the usual clamping-plate with tubular extension, showing the presser-ring formed upon the under side of the plate in place of being independent thereof.

In the accompanying drawings, A represents the usual frame, to which the reproducer-diaphragm B is connected through the medium of the plate or disk C and the usual screw-ring D, the reproducer-lever E and its connections being of the ordinary construction.

The several parts comprising the reproducer-head, as above described, are of the ordinary construction and is one of many forms of heads that may be used to illustrate the application of my invention thereto, the diaphragm being of any suitable material, either metallic, animal, or vegetable, although I prefer to use vellum or similar material.

With relation to the reproducer-diaphragm I find it necessary that some means should be provided by which the tension thereof may be controlled and regulated, so that all blasting and harsh tones may be obviated and a more perfect action of the diaphragm secured. To regulate or adjust the tension of the dia-

phragm, there is provided a ring F, which I term a "pressure-ring," that is adapted to bear down upon the face of the diaphragm, and by pressure thereon the tension of said diaphragm will be regulated, the pressure of the ring being secured by the screw-ring D upon the disk C, thereby increasing the excellency of the tone reproduction and removing all "scratching" and "blasting" heretofore existing. The pressure ring or device F can be brought with more or less pressure upon the diaphragm to suit any record by simply tightening or loosening the screw-ring D, thus increasing or decreasing the vibrations as circumstances require.

In place of having the pressure-ring independent, as shown in Figs. 1 and 2 of the drawings, the ring may be formed with or integral with the disk or plate C, as shown in Fig. 3 of the drawings.

The diaphragm B is held between two flat clamping-rings G H, and said rings, with the diaphragm, are independent of and removable from the reproducer-head, the lower one of the rings resting upon the flange I of the frame A. The diaphragm, with its two clamping-rings, being independent of the reproducer-head may be readily removed and replaced by a new one or may be used with any other form of head, as found desirable. The disk or plate C has a circumferential shoulder J, which extends slightly below the under side of the disk or plate to form a stop limiting the downward movement thereof.

As will be seen in Fig. 1, the ring F bears on the diaphragm inside the clamping-rings, and the ring is of such height as to prevent contact of the disk C with the clamping-ring next adjacent, and the ring D bears on the disk at a point out of the plane of the ring F, so that the pressure of the ring D is not directly on the ring F. By this arrangement of parts I have obtained better results and obviate all harshness and secure a nicety of adjustment.

Having now fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a sound reproducing, recording or transmitting instrument, a suitable frame, a reproducer-diaphragm secured between rings at its outer edge, said rings being removably

supported in the frame, a pressure-ring of less diameter than the outer ring and held within the same and supported upon the diaphragm and of greater thickness than said rings, a
5 disk or plate above the pressure-ring to give pressure thereto, and said disk engaging the pressure-ring out of the plane of rings, and a screw-ring engaging the screw-threads of the frame and adapted to force the disk or plate
10 against the pressure-ring, the said pressure-ring being retained between the upper ring and the said plate, all substantially as shown and described.

2. In a sound recording, reproducing or
15 transmitting instrument, a suitable frame, a reproducer-diaphragm, removable rings between which the diaphragm is held, an inde-

pendent pressure-ring bearing on the diaphragm inside said rings and of greater thickness than the adjacent ring, and a disk or
20 plate resting thereon and provided with a circumferential shoulder upon its under side to act as a stop, and against the inner wall of which the pressure-ring may bear, and a screw-ring bearing on the outer edge of the said
25 disk out of the plane of the pressure-ring, substantially as and for the purpose described.

In testimony that I claim the above I have hereunto subscribed my name in the presence of two witnesses.

JOHN F. LUSCOMB.

Witnesses:

W. A. GREAVES,
JOSEPH P. SILSBY.

B. KAPLAN.

MATRIX FOR MAKING GRAMOPHONE, ZONOPHONE, OR SIMILAR RECORDS.

(Application filed Nov. 1, 1901.)

(No Model.)

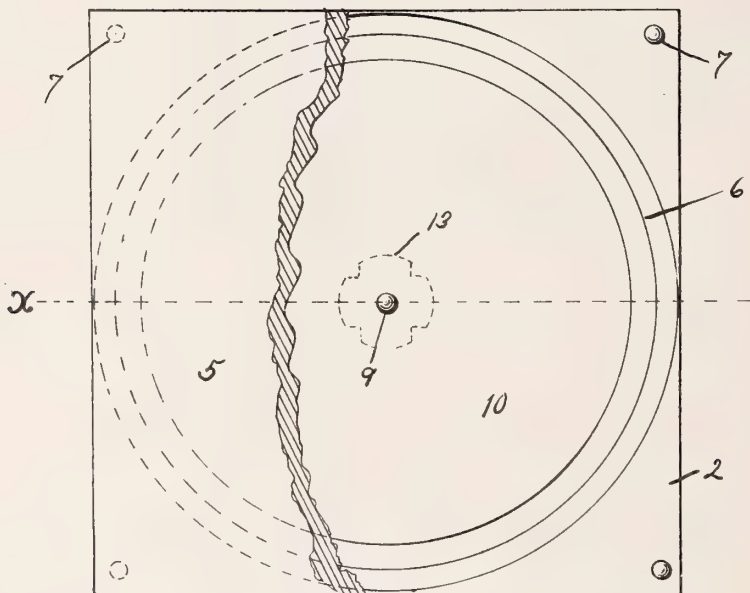


Fig. 1

Fig. 2.

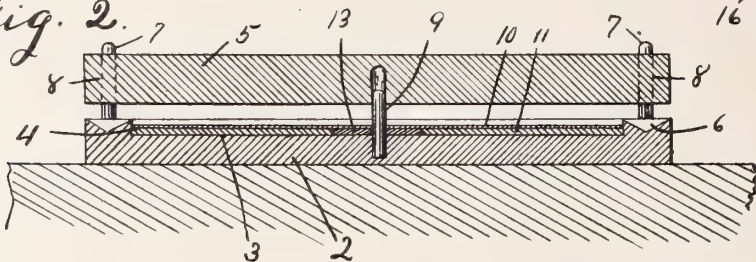


Fig. 3.

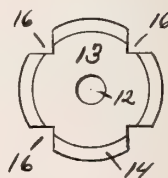


Fig. 4.

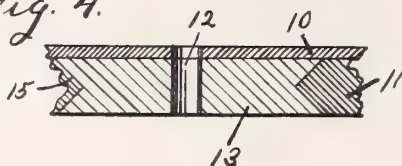
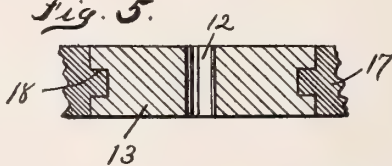


Fig. 5.



WITNESSES:

Henry Aug

Russell M. Everett.

INVENTOR

Bernard Kaplan

BY

Drake & Co.

ATTORNEYS.

UNITED STATES PATENT OFFICE.

BERNARD KAPLAN, OF NEWARK, NEW JERSEY.

MATRIX FOR MAKING GRAMOPHONE, ZONOPHONE, OR SIMILAR RECORDS.

SPECIFICATION forming part of Letters Patent No. 697,256, dated April 8, 1902.

Application filed November 1, 1901. Serial No. 80,761. (No model.)

To all whom it may concern:

Be it known that I, BERNARD KAPLAN, a citizen of the United States, residing at Newark, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Matrices for Making Gramophone, Zonophone, or Similar Records; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

This invention relates to matrices used in the molding or manufacture of talking-machine records, which have the general form of a disk; and the objects of the invention are to strengthen the middle of the matrix around the hole or opening for the center-pin of the dies, to thus increase the durability of the matrix, to obtain more perfect records, and to secure other advantages and results, some of which may be referred to hereinafter in connection with the description of the working parts.

The invention consists in the improved matrix for making records for gramophones, zonophones, &c., and in the arrangements and combinations of parts of the same, all substantially as will be hereinafter set forth, and finally embraced in the clauses of the claim.

Referring to the accompanying drawings, in which like letters of reference indicate corresponding parts in each of the several figures, Figure 1 is a plan of a pair of dies with a matrix of my improved construction in position therein, the upper die-plate being broken away to show the construction more clearly. Fig. 2 is a central cross-section as on line *x*, Fig. 1, the die-plates being slightly separated. Fig. 3 is a plan of a certain washer in which my invention particularly inheres; and Figs. 4 and 5 are central detail sections of the middle portions of matrices on an enlarged scale, the latter showing the application of my invention to a solid-copper matrix.

In said drawings, 2 indicates the lower of a pair of die-plates such as are commonly

used, said die-plate having a central recess or depression 3, in the bottom of which the matrix 4 is laid. A suitable quantity of the composition or substance from which the record is to be made is then laid upon the matrix and the upper die-plate 5, which is plane at its lower face, is forced down upon the lower die-plate 2 with a pressure of several thousand pounds, more or less, said die-plate being preferably hot. This spreads out the composition or stock, forcing it into the grooves and markings of the face of the matrix and filling the recessed chamber 3 of the lower die-plate. Any overflow escapes into a gutter or groove 6 around the die-chamber 3.

The lower die-plate 2 is provided with the usual dowel-pins 7, adapted to enter sockets 8 in the upper plate 5, and at the center of said lower die-plate is an upright pin 9, which forms the central opening commonly found in records of the class to which this invention relates.

The matrix 4 most commonly employed comprises a thin sheet or facing 10, of copper, formed by the process of electrotyping and provided with a backing 11, of lead or the like. This after being planed at the back is put in a lathe and turned down at the edges, as well as bored at the center to form the hole 12 for the center-pin 9. In practice, however, it has been found that with a matrix of this construction the composition or stock under the tremendous pressure of the dies will "flow" in between the walls of the central aperture 12 and the pin 9 to a greater or less extent and force the edges of the matrix around said central aperture 12 upward and outward. This produces a sort of bur or hub on the matrix and a corresponding depression in the record, as well as forming a kind of flange around the center hole of the record. The matrix has to be hammered flat again, and this is apt to batter and disfigure it.

The purpose of my invention is to so strengthen the central part of the matrix that it will withstand the tendency of the tremendous pressure of the dies to force it out of shape. To this end I provide the matrix with a central bushing 13, preferably of steel or iron, which will be unaffected by the pressure. This bushing is preferably applied as

a disk to the central part of the back of the copper face 10 in making the matrix and the lead backing 11 flowed around said disk. Then after planing and turning the matrix, as usual, it is bored through the disk to form the central opening 12. The periphery of said bushing 13 may be oppositely beveled, as at 14, Figs. 2 and 3, or grooved or undercut in any suitable manner, as indicated at 15 in Fig. 4 or 18 in Fig. 5, so as to engage with the lead backing when said lead is poured around. The edges of the bushing may also be radially notched, as at 16, in order to hold it more firmly against any possible rotation, or other equivalent means may be employed for this purpose.

Obviously my invention can be applied to a solid-copper matrix 17, if desired, as shown in Fig. 5, the bushing in this case being preferably applied to the mold in electrotyping and the copper deposited directly there-around.

Having thus described the invention, what I claim as new is—

1. A matrix for making records for gramophones, zonophones, &c., having at its center a bushing of more resisting material than the body of the matrix.

2. A matrix of the character described, having at its center a disk of material harder than the body of the matrix, said matrix having a central perforation through said disk.

3. A matrix of the character described, comprising a discous body portion with a central bushing in the plane of said body and being of harder material.

4. A matrix for making records for gramophones, zonophones, &c., comprising a facing 10, of copper or the like, a backing 11, of lead or similar material, a bushing 13, of iron or steel at the center of the matrix and in the plane of the backing 11, said matrix being perforated through said bushing.

5. A matrix for making records for gramophones, zonophones, &c., comprising a facing 10, of copper or the like, a backing 11, of lead or similar material, and a bushing of ma-

terial harder than the backing inserted into said backing, the matrix being apertured through said bushing.

6. A matrix for making records for gramophones, zonophones, &c., comprising a copper face 10, a disk 13, applied to the back thereof, and a backing of lead or the like around said disk, said disk being more resistive material than the backing, and the matrix being perforated through said disk.

7. The herein-described matrix, having a facing 10, a bushing 13, centrally disposed at the back of said facing, and a backing 11, around said bushing, said bushing being of more resistive material than the backing and held in place thereby.

8. The herein-described matrix, having a facing 10, a center bushing 13, and a backing 12, around said bushing, said bushing being of harder material than the backing and being adapted at its peripheral edges to be overlapped by said backing and held in place.

9. The herein-described matrix having a facing 10, a center bushing 13, and a backing 11, around said bushing, said bushing being of harder material than said backing and being shaped in plan to be held against rotation by said backing.

10. A matrix for making records for gramophones, zonophones, &c., having a central bushing of material harder than the body of the matrix, said bushing being embedded in said body of the matrix and held thereby.

11. A matrix for making records for gramophones, zonophones, &c., having a central bushing of material harder than the body of the matrix, said bushing engaging at its edges with the said body of the matrix to prevent displacement.

In testimony that I claim the foregoing I have hereunto set my hand this 22d day of October, 1901.

BERNARD KAPLAN.

Witnesses:

CHARLES H. PELL,
C. B. PITNEY.

No. 697,969.

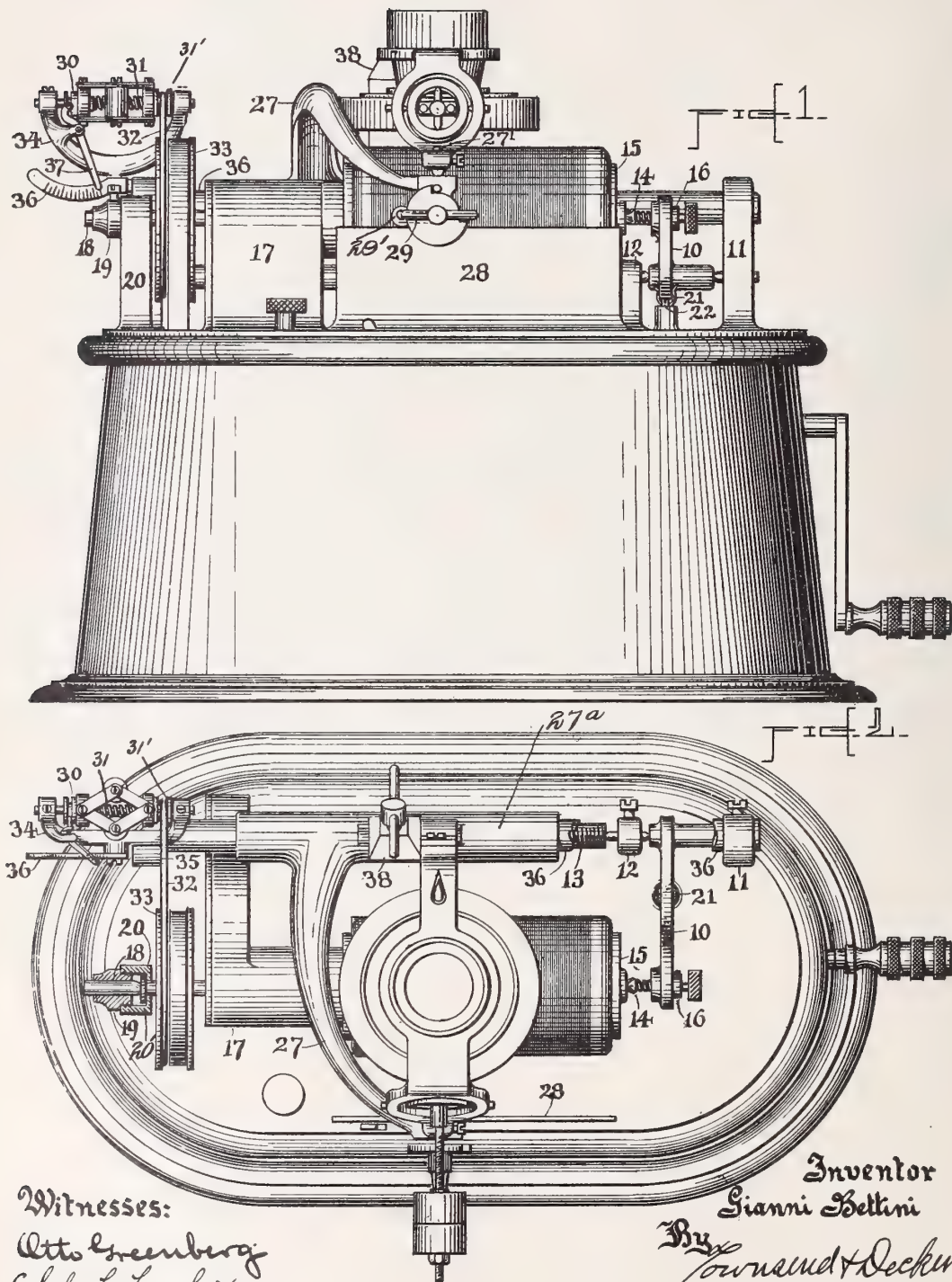
Patented Apr. 22, 1902.

G. BETTINI.
PHONOGRAPH OR GRAPHOPHONE.

(Application filed May 2, 1900.)

(No Model.)

2 Sheets—Sheet 1.



Witnesses:

Otto Greenberg
Echel L. Lawler

Inventor

Gianni Bettini

By
Townsend & Decker
Attorneys.

No. 697,969.

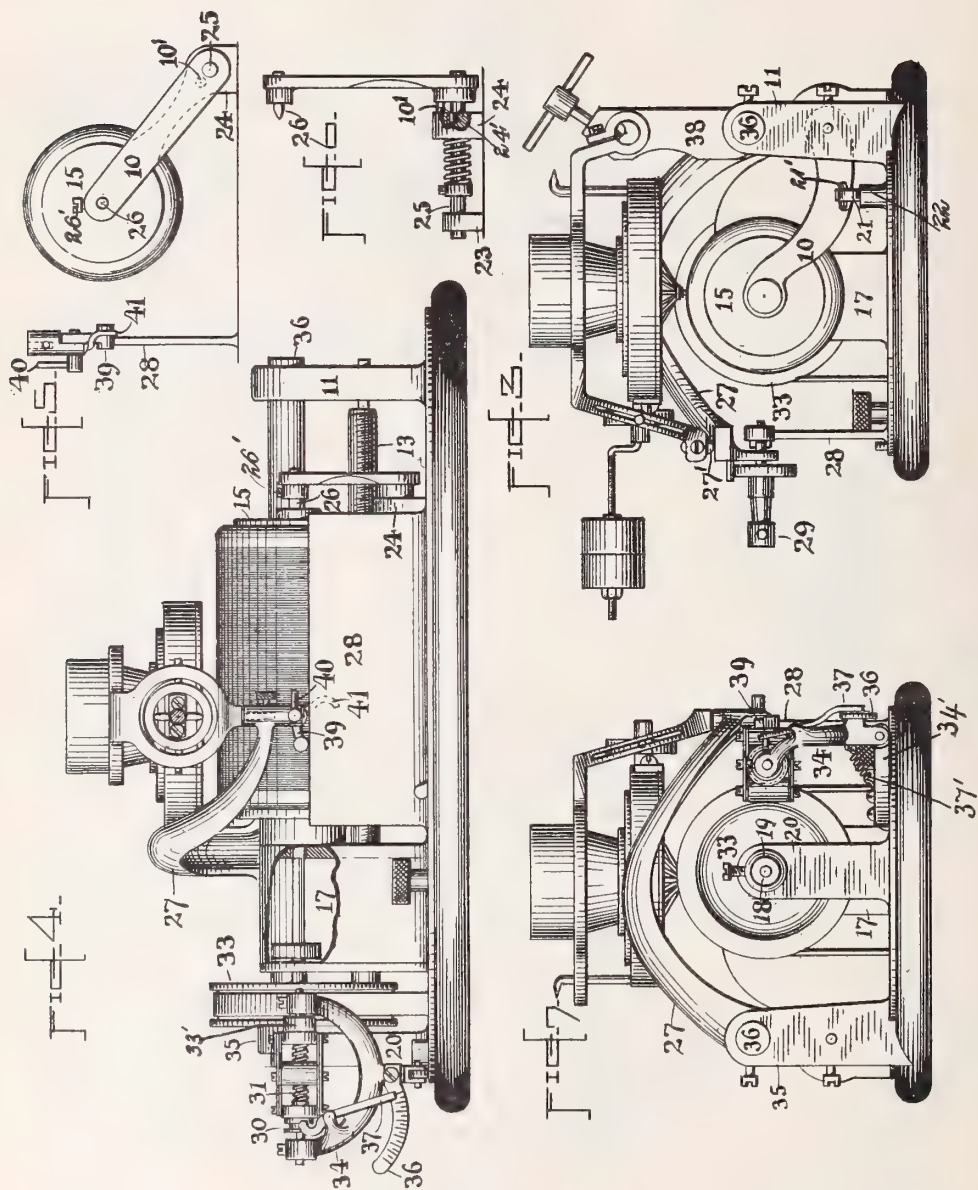
Patented Apr. 22, 1902.

G. BETTINI.
HONOGRAPH OR GRAPHOPHONE.

(Application filed May 2, 1900.)

(No Model.)

2 Sheets—Sheet 2.



Witnesses:

Otto Greenberg
Ethel L. Lawler

Inventor
Gianni Bettini

By Townsend & Decker
Attorneys.

UNITED STATES PATENT OFFICE.

GIANNI BETTINI, OF NEW YORK, N. Y.

PHONOGRAPH OR GRAPHOPHONE.

SPECIFICATION forming part of Letters Patent No. 697,969, dated April 22, 1902.

Application filed May 2, 1900. Serial No. 15,221. (No model.)

To all whom it may concern:

Be it known that I, GIANNI BETTINI, a citizen of the United States, and a resident of 110 Fifth avenue, New York city, in the county
5 of New York and State of New York, have invented certain new and useful Improvements in Phonographs and Graphophones, of which the following is a specification.

This invention relates to improvements in
10 phonograph and graphophone mechanism, and has for its objects improvements in the carrier for the recorder or reproducer, improvements in the manner of mounting the shaft carrying the record-cylinder, and im-
15 provements in the manner of regulating the speed at which the cylinder in the act of reproduction may be rotated in order to reproduce the recorded matter with the exact cadence in which it was recorded upon the cyl-
20 inder.

A further object of the invention is the general simplification of the various adjuncts of a phonograph or graphophone.

With these objects in view the invention
25 consists in the formation, construction, and combination of parts hereinafter described and claimed.

In the accompanying drawings, which form a part of this specification, Figure 1 represents in front elevation a phonograph embodying the features of my invention. Fig. 2 represents the same in plan view. Fig. 3 is an end view thereof. Figs. 4, 5, 6, and 7 represent modifications in details.

35 In phonographs and graphophones it is usual to provide for the mandrel which carries the cylinder a bearing at only one end thereof, so that the cylinder may be readily applied and removed from the other or free
40 end. In this manner of mounting the cylinder it is next to impossible to prevent the movement of the free or unsupported end of the mandrel during operation. This defect is remedied in the present invention by providing a bearing for both ends of the mandrel. In this improved construction it is of
45 course necessary that the bearing at what was formerly the free end of the mandrel should be removable in order that the cylinder may
50 be applied to and removed from the mandrel. For this purpose said bearing is mounted in

a hinged or pivoted arm. Such an arm is illustrated at 10. This arm may be pivotally mounted upon the machine in any suitable way. It is shown in Fig. 1 as mounted by
55 means of cone-bearings between a post, as 11, and an intermediate post 12. The diaphragm-carrier is moved from a feed-screw in a well-known manner. This feed-screw 13 in the form of machine shown is mounted in line
60 with the bearings of the arm 10, and for this purpose the cone in the intermediate post 12 may be made double, serving as a bearing for the adjacent ends of both of these parts.

In the free end of the arm 10 is mounted a
65 cone 14, which serves as a bearing for the end of the mandrel 15. This cone must be provided with a horizontal movement, by which it may be retracted from the mandrel when it is desired to swing the arm away from the
70 end of the mandrel. For this purpose said cone is preferably mounted upon a rod extending through the arm 10 and provided at its end opposite the cone with a milled head. A spring is also placed upon this rod between
75 the cone and the arm 10 for holding the cone in the bearing at the end of the mandrel. At the side of the arm opposite to the spring there is also placed upon said rod an adjustable collar, as 16, by which the pressure of
80 the cone against the mandrel may be regulated. The opposite end of the mandrel passes through a support, as 17, which serves to hold the mandrel in its approximate position while the arm 10 is removed from the end
85 thereof, but does not engage the mandrel when in operation, since it is held free from said support between the cone-bearing just described and the cone-bearing 18 at its opposite end. The latter cone is adjustably
90 mounted in a sleeve 19, removably secured in the post or upright 20, said cone being fixed in position after adjustment by means of a set-screw, as indicated. The end of the mandrel supported by this cone is preferably
95 provided with a head 20', seated in said upright 20, as indicated. This head prevents any accidental displacement of the mandrel while the bearing-in arm 10 is out of engagement therewith. This head might also serve
100 as a means of holding the mandrel in substantially normal position during the removal

of the cone 14 therefrom, in which instance the supplemental support 17 may be dispensed with.

To insure the maintenance of the bearing 5 carried by the arm 10 in alinement with the mandrel and its opposite bearing, said arm may rest upon the abutment, as 22, provided therefor on the pedestal. It may be retained upon said abutment by means of a U-spring, 10 as seen at 21, the curved ends of said spring taking into slight depressions on the sides of arm 10, as indicated at 21' in Fig. 3.

In mounting the mandrel in bearings at both ends, substantially in the manner described, and especially by the use of cone-bearings therefor, it will never vary from a fixed position, thereby materially aiding in the production of a perfect record and in a perfect reproduction thereof.

20 Another mode of construction for the removable bearing and another manner for mounting the same is illustrated in Figs. 4, 5, and 6. Therein said arm 10 is shown as mounted, by means of a shaft 25, in a couple 25 of posts 23 24 near the back of the machine. Upon the shaft 25 is a spring mounted between a collar on the shaft and the post 24. This is intended to hold the cone 26, carried by the free end of the arm, into engagement 30 with the bearing in the end of the mandrel. This cone is adjustable in said arm by means of set-screw 26' to regulate its engagement with said bearing. The stop for limiting the movement of this arm consists of a pin, as 35 10', which when the cone is in the bearing rests in an aperture 24' in the post 24, but which rides upon the face of said post when the cone is disengaged from said bearing and the arm is thrown back for the application 40 of a cylinder to the mandrel or the removal thereof.

The speaker-arm or that by which the recorder and reproducer are, in effect, carried is in the present invention formed in such a 45 way as to provide a ready application thereof to either the recorder or reproducer and the ready replacement of one by the other and also for its own speedy removal from the vicinity of the cylinder. This arm is illustrated at 27. It has at its rear end a sleeve 27^a, termed the "back-rod" sleeve. Thence it arches over the cylinder toward the front of the machine and is curved to the right and forms at its free end a support or rest 55 for the forward end of the frame carrying the diaphragm and appurtenances of the recorder and reproducer. This frame is removably supported in the projection 38, extending upwardly from the back-rod sleeve. Through 60 this end of said frame passes an adjustable pin 27', held in place by a set-screw. This pin engages said rest, and by it said frame may be adjusted with respect to said arm. The forward end of the arm 27 is provided 65 with any suitable form of lifting lever mechanism, which in turn rests and rides upon the straight edge 28.

There is no novelty claimed for the lifting lever mechanism seen in Figs. 1 and 2 nor for the manner of attachment of the repro- 70 ducer-frame to the projection 38, since they form parts of the device disclosed in Patent No. 643,183, granted to me February 13, 1900. Said lifting mechanism consists of a cam provided with an antifriction-roller 29' and is 75 shifted, by means of the T-head 29, to raise or lower the stylus of the diaphragm with respect to the cylinder.

An improved form of lifting-lever is seen in Figs. 4, 5, and 7. Therein the roller that 80 rides on the straight edge is mounted in the end of a lever, as 39, which is pivoted in the end of the arm 27 under the rest. A handle, as 40, serves to throw the lever to bring the roller under the rest, as in Fig. 5, thereby 85 raising the stylus from the cylinder, or to throw it to the side, as seen in Fig. 4, to lower the stylus upon the cylinder. The curved projection 41 supports the lever in the former position. 90

As already suggested, it is essential for the perfect reproduction of a record that the speed of the record when being reproduced shall be identical with that of the cylinder during the act of recording. To effect this, 95 an indicator has been devised. One form thereof is illustrated and one mode of application is indicated in Figs. 1 and 2 and another in Figs. 4 and 7. This indicator consists in the main of a ball-governor mechanism whose sliding collar is indicated at 30, 100 and the spring against which said collar operates is indicated at 31. The shaft of this governor is shown in Figs. 1 and 2 as receiving its rotation by means of a small belt or 105 cord 32, which passes from the sheave 31' thereon around the pulley 33 on the mandrel 15. The shaft of the indicator is mounted in a frame, as 34, which in turn may be suitably supported upon any part of the machine, as upon the post 35 or upon the end 110 of the rod 36, which is mounted in the upper ends of the posts 35 and 11, and upon which the back-rod sleeve is guided. This manner of mounting is seen in Figs. 1 and 2. To the 115 frame 34 is attached a suitable scale, as 36^x, over which travels a pointer 37 of the indicator. This pointer is pivoted to the frame 34 and has a pin or projection therefrom extending into a groove in the sliding collar 30. 120 Thus it will be seen that as the balls of the governor move out and in the pointer will be made to travel the scale 36^x, and by regulating the speed of the mechanism which drives the mandrel in any of the well-known 125 ways the pointer may be made to stand at exactly the same position during the reproduction of a record that it occupied during the act of recording.

The preferred form of combining the indi- 130 cator with the phonograph is illustrated in Figs. 4 and 7. Therein the frame 34 is hinged to the base of the phonograph by means of a plate 34', and for the sheave 31' on the gov-

ernor-shaft is substituted a friction-pulley 33', which engages the pulley 33 on the mandrel. These pulleys are maintained in engagement by means of a spring 37', Fig. 7.

Obviously this frictional pulley may be maintained in engagement with pulley 33 by means of a weight, if desired.

Attention is also called to the standard or pedestal of the machine in which the motor is mounted. This has been restricted in extent from the usual form of pedestal and is no larger than is necessary to furnish the required area of top for the support of the superstructure carried thereby. It is ellipsoidal in plan and horizontal section and tapers from its base to its top. Its restricted dimensions and rounded corners reduces the cost of manufacture and expense in shipping and at the same time furnishes a pedestal more pleasing in appearance and less cumbersome.

Other modifications than those already mentioned may be made in the features embodying the present invention without departing therefrom.

The invention claimed is—

1. In a phonograph or like mechanism the combination with the mandrel for carrying the record-cylinder, of a fixed bearing for one end thereof, a movable bearing for the other end, an arm carrying said movable bearing, a post 11, a bearing for said arm in the post 11, a post 12, a second bearing for said arm in the post 12, said latter bearing serving also for the propelling-screw 13, so that the bearing carried by this arm may be swung out of the way of the cylinder in a plane at right angles to the axis of the mandrel, and a spring for holding said movable bearing in engagement with the mandrel, substantially as set forth.

2. In a phonograph or like mechanism the combination with the mandrel for carrying the record-cylinder, of a fixed bearing for one end thereof, a movable bearing for the other end, an arm carrying said movable bearing, a post 11, a bearing in said post for said arm, a post 12, a bearing for said arm in the post 12, said latter bearing serving also for the propelling-screw 13, so that the bearing carried by this arm may be swung out of the way of the

cylinder in a plane at right angles to the axis of the mandrel, a spring for holding said movable bearing in engagement with the mandrel, said arm being provided with depressions in the side thereof, an abutment on the pedestal to receive said arm, and springs upon said abutment between which the arm rests and which enter the said depressions to hold the arm in place.

3. In a phonograph or like mechanism, the combination with the back-rod sleeve, of the speaker-arm formed integrally therewith and projecting forwardly therefrom in an arch over the record-cylinder and then curved to the right and terminated in a rest or support for the recorder or reproducer, a projection arising from said sleeve, a frame carrying the diaphragm and appurtenances movably secured in said projection, an adjusting-pin in the forward end of said frame resting freely upon and unattached to said support, for the purpose set forth.

4. In a phonograph or like mechanism the combination with the mandrel of the record-cylinder having a driving-pulley thereon, of a speed-indicator consisting of a ball-governor mechanism hinged to the base of the phonograph, a friction-wheel on the arbor carrying the balls of the indicator, a spring for holding said wheel in engagement with the pulley on the mandrel of the record-cylinder, a scale, and a pointer actuated by the sliding sleeve of the ball-governor mechanism, for the purpose set forth.

5. The combination with the diaphragm and appurtenances, of the speaker-arm provided with the back-rod sleeve on its rear end and with a rest upon its forward or free end, the frame carrying the diaphragm and appurtenances and movably secured to the back-rod sleeve, and an adjusting-pin in the forward end of said frame by which said forward end is supported freely upon said rest and unattached thereto.

Signed at New York, in the county of New York and State of New York, this 25th day of April, A. D. 1900.

GIANNI BETTINI.

Witnesses:

DELBERT H. DECKER,
D. P. MITCHELL.





No. 698,082.

Patented Apr. 22, 1902.

C. W. VERNON.
PHONOGRAPH.

(Application filed Oct. 21, 1901.)

(No Model.)

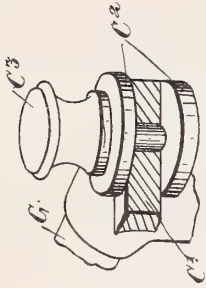


Fig. 5.

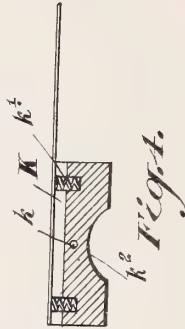


Fig. 4.

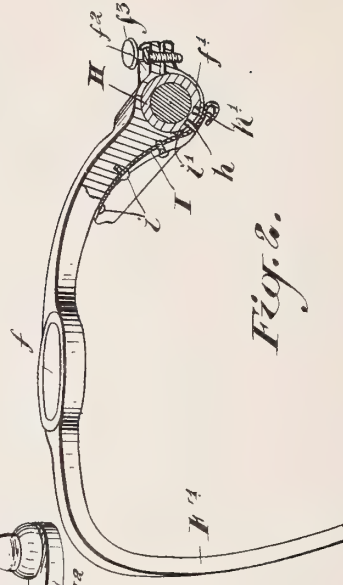


Fig. 6.

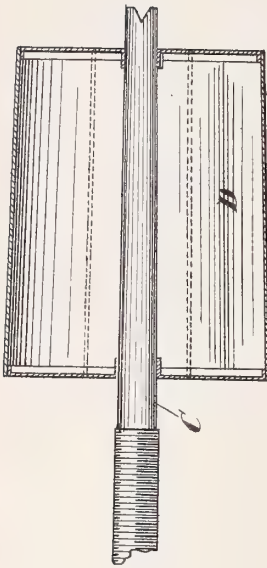


Fig. 3.

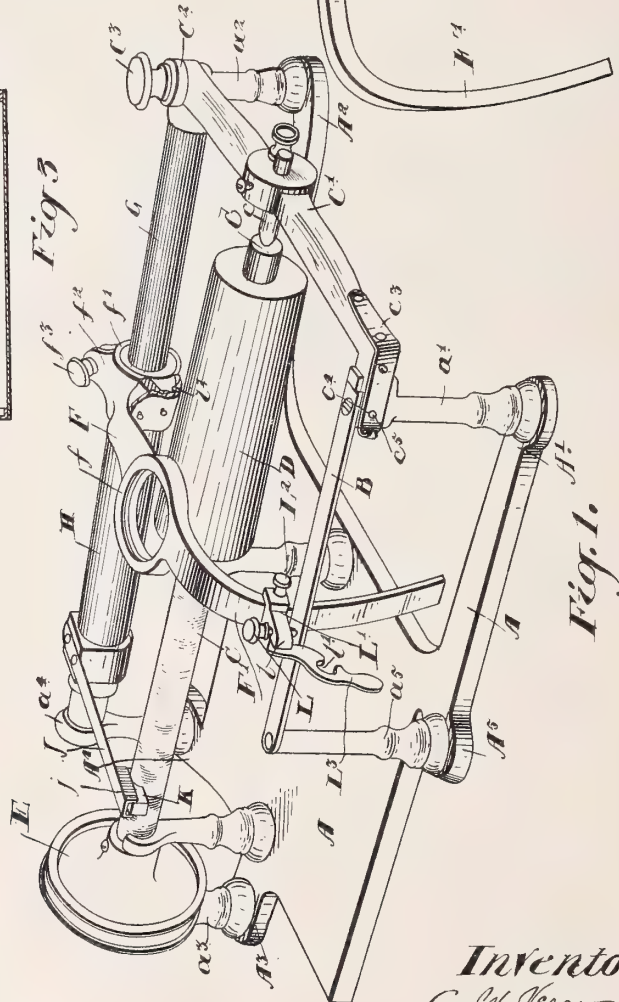


Fig. 1.

Witnesses.
L. Fumble
L. C. Reynolds.

Inventor.
C. W. Vernon.
by *fatherstonhaugh* *Edg*

UNITED STATES PATENT OFFICE.

CHARLES WILLIAM VERNON, OF TORONTO, CANADA, ASSIGNOR OF ONE-HALF TO MATHEW CROMWELL FLETCHER HAMBLBY, OF TORONTO, CANADA, AND MARGARET HAMBLBY, OF OTTAWA, CANADA.

PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 698,082, dated April 22, 1902.

Application filed October 21, 1901. Serial No. 79,425. (No model.)

To all whom it may concern:

Be it known that I, CHARLES WILLIAM VERNON, inventor, of the city of Toronto, in the county of York, in the Province of Ontario, Canada, have invented certain new and useful Improvements in Phonographs, of which the following is a specification.

My invention relates to improvements in phonographs; and the object of the invention is to improve the details of construction and produce a more simple and efficient device. To this end the invention consists in the construction and arrangement hereinafter described, and particularly pointed out in the claims. To carry out these objects, I have constructed and arranged my phonograph in the manner which I shall now describe.

Figure 1 is a perspective view of a phonograph-frame constructed in accordance with my invention. Fig. 2 is a perspective detail, partially in section, of the speaker or recorder arm. Fig. 3 is a longitudinal section through the cylinder and tapered end of the arbor upon which the cylinder fits. Fig. 4 is a detail of the feed-nut. Fig. 5 is a detail showing the manner of hinging the gate.

In the drawings like letters of reference indicate corresponding parts in each figure.

A is the bed-plate or base of the machine, which has the outwardly-extending portions A', A², A³, A⁴, and A⁵.

a', a², a³, a⁴, and a⁵ are pillars, which are formed separately, being turned into any suitable design. The pillars are secured to the ends of the projections by machine-screws extending outwardly through the arms of the projections into the pillars. It is of course not necessary to describe the exact form of screw, except that I may say it has a flush head at the bottom. When the pillars are being properly alined, so as to carry the frame, pin-holes are made through the base into the pillars, one at each side of the screw, and pins put into them, so as to set it rigidly.

B is a bar extending from the pillar a' to the pillar a⁵ and secured to the top of the pillars by the countersunk screws.

C is the main shaft or arbor of the phonograph, which is supported at one end in suitable journals at the top of the pillars a³ and

a⁶, the pillar a⁶ being formed and attached to the bed-plate similarly to the other pillars referred to. The opposite end of the arbor C is tapered and has its bearing on the conical end of the pin c, which extends through the gate C'. The gate C' is hinged at one end between the jaws C², being held therein by the pin C³. (See detail Fig. 5.) The gate C', it will be noticed in reference to Fig. 1, has a spring-clasp c³, having a hole c⁴, through which extends the pin c⁵, projecting from the pillar a'.

D is a cylinder on which the record is placed. The cylinder D may be a large cylinder, as indicated in Fig. 3, or a small cylinder, as indicated in dotted lines in Fig. 3 and full lines in Fig. 1. In order to place a large or small cylinder in position on the tapered end of the shaft C, the gate C' has to be swung out, when the cylinder may readily be withdrawn from the tapered end of the shaft C and a larger or smaller one placed thereon. On account of the end of the shaft being tapered it will be understood that a cylinder may be taken off and a new one substituted with ease.

E is the driving-pulley, which is suitably secured on the arbor or shaft C near one end.

F is the recorder or speaker arm, which is curved in form, as shown, and provided in the center with an orifice f', in which the speaker or recorder or stylus is placed. The free end F' of the arm F is concentric to the rod G, which is suitably held at the ends in the pillars a² and a⁴. The opposite end of the arm F is provided with a circular opening f and projecting lugs f², through which extends the clamp-screw f³.

H is a sleeve which extends through the opening f'.

I is a spring secured underneath the arm F by screws i and having located on its free end the pin i', which is designed to engage one or other of the recesses h and h', this depending on the height it is desired to raise the arm, and consequently the recorder or speaker. If the large cylinder is used, the pin i' is inserted into the recess h, so as to bring the recorder or speaker close to the cylinder; but if the small cylinder is used the spring I is thrown out and the pin i' is

transferred to the lowermost notch h' , thus adjusting the arm without adjusting the sleeve, and thus serving to keep the spring-arm J and the nut K pivotally held in the end jaw j of the arm in contact with the screw feed-thread of the shaft or arbor C, no matter whether the large cylinder is used or the small one. It will be noticed that the nut K is pivotally held at the center upon the pin k and acted upon at the ends by the spiral springs k' , extending underneath the arm J into recesses in the nut. The nut K is provided with a bottom arc-shaped recess k^2 , which is threaded to correspond with the thread on the arbor C. The object of pivoting the nut is to provide more or less rock to it, so that the arm J, which is set with the constant pressure on the nut, will allow of the nut accommodating itself to any slight adjustment of the arm F.

The arm F is adjusted by means of a set-screw L, which extends through a bracket L' , fastened to the end F' of the arm F by another set-screw L^2 .

L^3 is a handle pivoted at the upper end in the jaws l of the bracket L' and provided intermediate of its length with an arc-shaped recess l' . By pushing upwardly upon the arm L^3 the arm F may be raised so that it may be locked from vertical displacement and slid backwardly and forwardly with the recorder or speaker raised clear of the record. By raising the handle L^3 sufficiently the notch l may be brought over the bar B, whereupon the arm may be swung backwardly and forwardly clear of the record on the cylinder.

It will of course be understood that when the shaft or arbor is driven by means of the pulley E the nut K, engaging with the thread on the arbor C, will, on account of the arm J being secured to the sleeve H, as indicated, move the arm F longitudinally, so that the recorder or speaker is in operative contact with the record on the cylinder.

By the construction I have above described it will be seen that I am enabled to produce the frame of the machine very cheaply and avoid the difficulty of centering the arbors and supporting-rods, as the pillars may be formed up very accurately and the portions and arbor supported by the pillars may be readily and accurately fitted to them. It will also be seen that I may adjust the recorder-arm for different-sized cylinders without interfering with the feeding-nut, which engages with the screw-thread on the shaft or arbor. I am also enabled to provide for the movement of the recorder-arm over the cylinder without any danger of it coming in contact with the record, so that such arm may be readily placed in any position on the record so as to repeat any portion thereof as may be desired.

From the construction of the arbor with the end tapered and the cylinder having a tapered hole and being hollow, as indicated, it will be seen that such cylinder may be readily removed and another one substituted. It will also be understood on account of the fine adjustment of the feeding-arm the record may be saved and used until worn out.

What I claim as my invention is—

1. The combination with the frame, the arbor suitably journaled therein, the side rod forming one side of the frame, the sleeve longitudinally adjustable thereon, the recorder-arm secured at one end to the sleeve and suitably supported at the opposite end on the frame, the feed-arm suitably secured to the sleeve and provided with a nut having an arc-shaped recess threaded so as to engage with the screw-threaded end of the arbor and said nut being centrally pivoted in the end of the arm and spring-held as and for the purpose specified.

2. The combination with the arbor threaded at one end and suitably journaled in the frame, the cylinder suitably secured to the arbor, the longitudinal side rod, the sleeve fitting thereon and provided with radially-disposed notches, the recorder-arm secured to the sleeve, the feed-arm secured to the sleeve at one end, the nut secured to the opposite end of the feed-arm and meshing with the threaded end of the arbor, the spring on the recorder-arm provided with an end pin designed to engage one or other of the two notches in the sleeve as and for the purpose specified.

3. The combination with the arbor, suitably journaled, and the cylinder fitting thereon, of the recorder-arm pivotally held at one end and provided with an arc-shaped end, concentric to the pivoted rod, the side bar of the frame, the bracket secured on the concentric end and the set-screw extending through the bracket and resting on the side bar of the frame as and for the purpose specified.

4. The combination of the arbor, suitably journaled and the cylinder fitting thereon, of the recorder-arm pivotally held at one end and provided with an arc-shaped end concentric to the pivotal rod, the side bar of the frame, the bracket secured on the concentric end and the set-screw extending through the bracket and resting on the side bar of the frame and the handle pivoted on the end of the bracket and provided with a notch designed to engage with the bar and locking the arm, so as to slide in the raised position as and for the purpose specified.

CHARLES WILLIAM VERNON.

Witnesses:

R. SHIELDS,
M. MACLAREN.

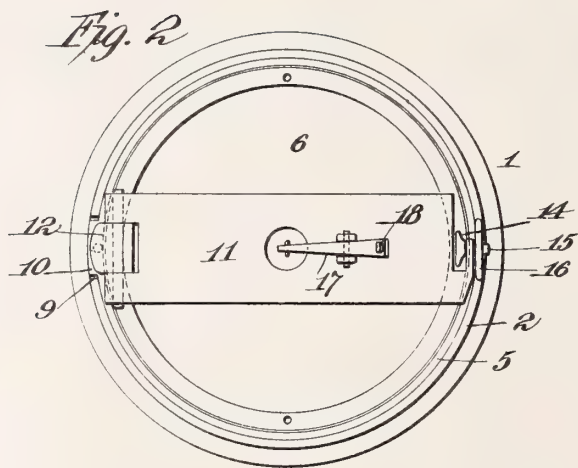
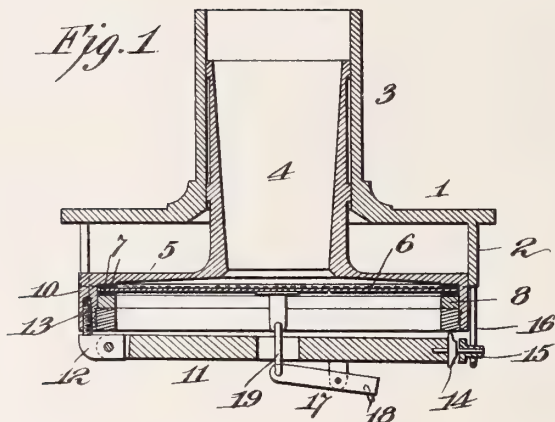
No. 698,602.

Patented Apr. 29, 1902.

P. WEBER.
PHONOGRAPHIC REPRODUCER.

(Application filed Feb. 6, 1901.)

(No Model.)



Witnesses:

Jas. F. Coleman
Jno. R. Taylor

Inventor

Peter Weber
by
Hyer Edmund & Son
Att'ys.

UNITED STATES PATENT OFFICE.

PETER WEBER, OF EAST ORANGE, NEW JERSEY.

PHONOGRAPHIC REPRODUCER.

SPECIFICATION forming part of Letters Patent No. 698,602, dated April 29, 1902.

Application filed February 6, 1901. Serial No. 46,170. (No model.)

To all whom it may concern:

Be it known that I, PETER WEBER, a citizen of the United States, residing at East Orange, in the county of Essex and State of New Jersey, have invented a certain new and useful Improvement in Phonographic Reproducers, (Case C,) of which the following is a specification.

My invention relates to improvements in reproducing apparatus for phonographs and allied talking-machines; and my object generally is to simplify the construction, reduce the expense, and improve the operation of such devices.

In order that the invention may be better understood, attention is directed to the accompanying drawings, forming part of this specification, and in which—

Figure 1 is a vertical sectional view of my improved reproducer, and Fig. 2 a bottom view of the same.

In both of the above views corresponding parts are represented by the same numerals of reference.

The body of the reproducer comprises a disk 1, having an annular flange 2 and a neck 3 cast therewith. The usual listening-tubes are fitted within or over the neck. Mounted to slide vertically within the neck 3 is a tube 4, cast at its lower end with a flanged disk 5, the latter forming the usual compensating weight. This disk carries the diaphragm 6, made, preferably, of glass and clamped in place between elastic gaskets 7 7 by means of a clamping-ring 8. By guiding the tube 4 in the neck 3 and the disk 5 within the flange 2 the disk-like compensating weight 5 and its contained diaphragm will be permitted to move only in a vertical direction. The flange 2 is provided at one side with a slot 9, fitting within which is an extension 10 on the flange of the compensating weight 5, whereby the compensating weight will be prevented from partaking of rotary movements in operation.

Extending diametrically across the bottom of the compensating weight and below the diaphragm is an auxiliary weighted lever 11, which at one side is pivoted or hinged to the head 12 of a threaded shank 13, the latter being screwed into the flange of the weight 5, but not being screwed entirely home, so that the auxiliary lever can move laterally with

respect to the diaphragm. At its other end the auxiliary weighted lever is provided with an antifriction-roller 14, which when the device is in operation bears against the lower edge of the flange of the compensating weight and at its extreme end is provided with a stud 15, received within a loop or yoke 16, depending from the flange 2, as shown. Pivoted to the auxiliary lever 11 is a lever 17, carrying a suitable reproducing-stylus 18 at one end and connecting at its other by means of a link 19 to the diaphragm 6.

In operation the downward movement of the auxiliary weighted lever 11 will be retarded by the yoke or loop 16 and the compensating weight 5 will rest upon and be supported by the antifriction-roller 14. If there are any diametrical variations or eccentricities in the record, the auxiliary lever, diaphragm, and compensating weight will be bodily moved upward or downward to always keep the reproducing-stylus in proper engagement with the record and with the requisite pressure. The inertia of these parts, however, prevents them from responding to the very rapid vibrations of the sound-record, which in consequence result only in the vibration of the diaphragm. Any longitudinal variations in the record will be accommodated and accurate tracking secured by reason of the lateral variations of which the auxiliary lever 11 is capable with respect to the pivot 13, in which movements the roller 14 will obviously be moved with respect to the flange of the compensating weight.

The whole device is effective in operation, simple in construction, and can be very economically made.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is as follows:

1. In a phonographic reproducing device; the combination of a disk-like body, a compensating weight movable vertically with respect to the same, a diaphragm carried by and bodily movable with said weight, an auxiliary lever universally pivoted to the compensating weight, and a reproducing device carried by said lever and connected to the diaphragm, substantially as set forth.

2. In a phonographic reproducing device, the combination of a disk-like body, a com-

5 compensating weight movable vertically with respect to the same, a diaphragm carried by and
bodily movable with said weight, an auxiliary
lever universally pivoted to the compensat-
ing weight, a reproducing device carried by
said lever and connected to the diaphragm,
and a yoke for limiting the downward move-
ment of said lever, substantially as set forth.

10 3. In a phonographic reproducing device,
the combination of a disk-like body having
an integral neck, a tube vertically movable
in said neck, a compensating weight carried
by said tube within the body, a diaphragm
carried by and bodily movable with the com-
pensating-weight, an auxiliary lever univer-
sally pivoted to said compensating weight
beneath the diaphragm, and a reproducing
device pivoted to said lever and connected
to the diaphragm, substantially as set forth.

20 4. In a phonographic reproducing device,
the combination of a disk-like body having
an integral neck, a tube vertically movable
in said neck, a compensating weight carried
by said tube within the body, a diaphragm
carried by and bodily movable with the com-
pensating weight, an auxiliary lever pivoted
to said compensating weight beneath the dia-
phragm and capable of lateral movement

with respect thereto, a reproducing device
pivoted to said lever and connected to the
diaphragm, and an antifriction-roller inter-
posed between the free end of said lever and
the compensating weight, substantially as
set forth.

5. In a phonographic reproducing device,
the combination of a disk-like body having
an integral neck, a tube vertically movable
in said neck, a compensating weight carried
by said tube within the body, a diaphragm
carried by and bodily movable with the com-
pensating weight, an auxiliary lever pivoted
to said compensating weight beneath the dia-
phragm and capable of lateral movement
with respect thereto, a reproducing device
pivoted to said lever and connected to the
diaphragm, an antifriction-roller interposed
between the free end of said lever and the
compensating weight, and a yoke for limiting
the downward and lateral movements of said
lever, substantially as set forth.

This specification signed and witnessed this
30th day of January, 1901.

PETER WEBER.

Witnesses:

HARRY F. MILLER,
J. H. MORAN.

No. 699,393.

Patented May 6, 1902.

J. KEMMER, JR.
TIME INDICATOR FOR PHONOGRAPHS.

(Application filed May 27, 1901.)

(No Model.)

Fig. 1.

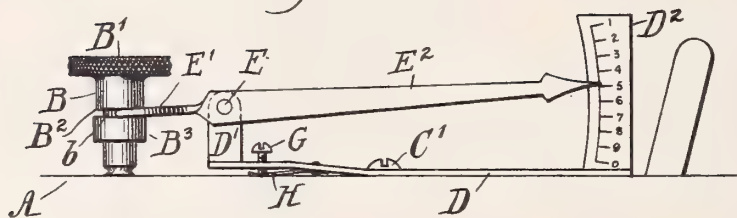
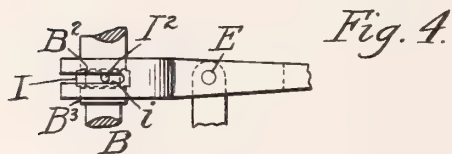
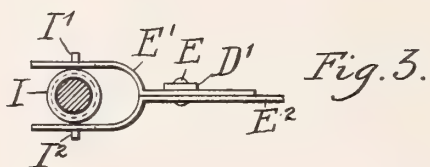
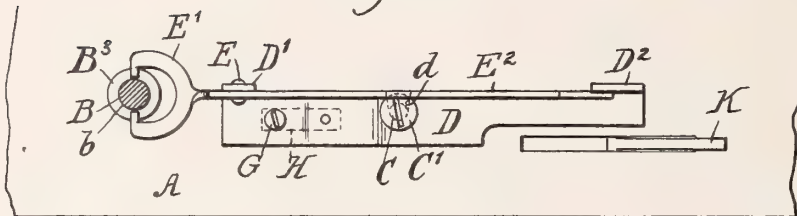


Fig. 2.



WITNESSES:

O. C. Winge

M. F. Boyle

INVENTOR

John Kemmer Jr.
BY
Thomas Lewis Stetson
ATTORNEY

UNITED STATES PATENT OFFICE.

JOHN KEMMER, JR., OF BROOKLYN, NEW YORK.

TIME-INDICATOR FOR PHONOGRAPHS.

SPECIFICATION forming part of Letters Patent No. 699,393, dated May 6, 1902.

Application filed May 27, 1901. Serial No. 62,045. (No model.)

To all whom it may concern:

Be it known that I, JOHN KEMMER, Jr., a citizen of the United States, residing in the borough of Brooklyn, in the city and State of New York, have invented a certain new and Improved Time-Indicator for Phonographs, of which the following is a specification.

It is common to provide means by a screw at an easily-accessible point in the front of the instrument, whereby the rate at which the mandrel carrying the record-cylinder is revolved may be increased or diminished. I will describe my invention as applied to an instrument having such provision in the form of the ordinary adjusting-screw.

I provide means whereby the rising and sinking of the screw in making the adjustment of the speed is magnified, technically multiplied, and indicated on a graduated scale. In what I esteem the most complete form of the invention the scale and the means for multiplying the motion are carried on a separate piece with provisions for easily attaching and detaching at will. I provide simple means for adjusting slightly to make the range of indications higher or lower at will.

The following is a description of what I consider the best means of carrying out the invention.

The accompanying drawings form a part of this specification.

Figure 1 is a front elevation, and Fig. 2 a plan view. The remaining figures show details of a modification, Fig. 3 being a plan view, and Fig. 4 a side elevation.

Similar letters of reference indicate corresponding parts in all the figures where they appear.

A is the base-flange of an ordinary phonograph instrument of the well-known Edison type.

B is the timing-screw, having the ordinary milled head B'. There is also on this screw a boss B² under its head and a permanently set collar B³. I will designate the groove between the boss B² and the collar B³ by *b*. There is the ordinary screw C, tapped in the flange A in the position represented, having a head C' with a plane under face.

The screw B is worked in the usual manner and produces the ordinary effect. Turning it up induces a retardation of the revo-

lutions of the mandrel, and consequently of the record-cylinder which is carried thereon, either for being impressed by the stylus in the "taking" of the record or for reproducing the sounds.

D is the foundation-plate of my attachment, of brass or other suitable material, preferably slightly elastic to allow of adjustment, as will presently appear. It is adapted to extend along on the flange A of the phonograph instrument and is secured thereon by the aid of a notch *d*, formed in its rear edge. To engage it for use, the screw C being sufficiently high, the plate is laid on the flange and pushed inward to receive the shank of the screw in the notch *d*. Then the screw being turned down holds it fast. The left end of the attachment D carries an upright or post D', on which is mounted by a pivot E an unequally-divided lever E' E². The short arm E' of this lever is forked, and the ends of the fork are rounded and turned inward. In applying my attachment these inwardly-turned ends are engaged in the groove *b* in the screw. The other end, the long arm E², of the lever has a greater motion proportional to its length. When the screw B is turned in one direction or the other to raise or lower it and correspondingly change the speed of the rotation of the mandrel, all in the ordinary manner, the change of position of the screw is magnified in the ratio of ten or some other ratio, according to the proportion of the lever.

D² is a taller post than the post D' and set on the opposite end of the plate D. An arc is graduated thereon, as indicated by the several numbers 1 2 3 4, &c. This arc corresponds to the curved motion of the long arm E².

K is the ordinary switch-lever.

There are reasons why in taking or recording a phonograph-record it may be expedient to revolve the mandrel, and consequently the record-cylinder, more rapidly on some occasions than on others, eminently to make a song of a given length exactly fill or come only a little within the length of the cylinder. It is essential to good work that the cylinder shall be revolved at exactly or very nearly the same rate in reproducing the sounds as the rate at which they were taken; otherwise the sounds given off will not only

be higher in tone if the cylinder is revolving too rapidly, but also, in accordance with the laws of production of articulate sounds, they will be less distinct. The same result, perhaps in a still greater degree in its effect in confusing and thickening the sounds, will obtain if the delivery is too slow. The necessity for attaining about the same rate of velocity in reproducing the sound as in taking the record has been long recognized. Skilful operators, recognizing quickly whether the speed with which it is started is too rapid or too slow, can arrive at the correct rate with but a few trials; but the difficulty of attaining the proper speed is a serious obstacle to the success of beginners. Too often the amateur is content to reproduce the sounds at a wrong rate, and thus fails to give the full perfection of result to be desired, even after much time and labor has been spent in endeavors to adjust the speed by trials. If care has been taken to permanently record the speed at which the mandrel was revolved in taking the record, my invention provides for attaining the adjustment instantly and with certainty.

In taking and in reproducing a record my attachment should be on the instrument and in the same condition of adjustment, which latter will be presently explained. At the close of a successful job in the manufacture of a record the position of the long arm E^2 on the scale D^2 is observed and noted on some convenient part of the record-cylinder or on the tag or card which accompanies it. The instrument may subsequently be used at various faster or slower rates and the same in reproducing; but when it comes to reproducing this particular record the operator looks at the card and seeing that it is " $6\frac{3}{4}$ " turns the screw B until the index is in the corresponding position between the marks " 6 " and " 7 ," and he knows that the speed will be right.

If the records are always made and the sounds reproduced by the same identical instrument, there is no occasion for the adjusting now to be described; but when another attachment is used on this instrument or when this attachment is applied to another instrument there may be peculiarities in the instrument or in the screw B which will carry the short arm of the lever a little higher or lower for a given rate of speed. I provide for adjusting my instrument to accommodate such conditions.

The plate D is hard sheet metal of proper thickness and will yield elastically.

G is a screw tapped through the plate D at the point represented and having a shoe H , which is adapted to press smoothly on the flange A . For ordinary work this screw is set so as to lift that portion—the left end of the plate D —a little. If it is desired to lower the pivot E , so that the indications of the lever E' E^2 for a given rate of speed will be lower on the scale D^2 , the screw G is turned

in one direction, thus causing the elasticity of the plate D to assert itself and lower the post D , and consequently to lower the pivot E . If, on the contrary, it is desired to raise the pivot, so that the indications shall be higher for a given sound, the screw G is turned in the opposite direction to raise that end of the plate D and the post D' and the pivot.

I attach importance to the simplicity of the construction. Some of the advantages due to certain features of the invention may be separately enumerated as follows: First. By reason of the notched plate D d having the post D' , carrying a pivot, and the post D^2 , carrying a scale, and of the lever E' E^2 , working on each, I am able not only to apply the indicator to ordinary instruments with little preparation, but to accomplish the ends with simple mechanism. Second. By reason of the fact that I derive the motion of the index E^2 from the slight longitudinal motion of the adjusting-screw B , I am able to traverse the index E^2 over a large graduated scale D^2 by a single piece of mechanism—the unequally-divided lever E —and avoid the complication heretofore necessary to utilize the long and clearly-divided scale. Third. By reason of the adjusting-screw G all the indications can be made higher or lower, while preserving the same ratio as before.

Modifications may be made without departing from the principle or sacrificing the advantages of the invention. I prefer to make the upright portions D' D^2 integral with the plate D and to make the lever E' E^2 of a single piece of sheet metal, with the edges of the metal presented upward and downward in the long arm E^2 , but with the sheet metal twisted so that the edges shall be presented horizontally in the short arm E' . The shoe H may be omitted. Other means of adjusting the pivot up and down may be employed; but I esteem it easy to make the plate D sufficiently elastic to allow of the simple mode of adjustment described. The adjusting may be entirely omitted. The plate D should be sufficiently narrow in that portion to allow the switch-lever K to move in front of it. The plate may be much longer, so as to extend past that lever when in the stopped position. In such case the switch-lever interferes a little with facility of removal and reapplying of the attachment, and to effect such the notch d must be carefully formed to allow of releasing the plate by raising its front edge after the screw C is liberally loosened, or if there is still difficulty the screw C may be temporarily taken out to allow the attachment to be removed and reapplied.

Figs. 3 and 4 show a modification which some may prefer in the provisions for engaging the short arm of the lever with the screw. I produce a wide groove corresponding to b and insert therein a ring I , which is so closely confined between the boss above corresponding to B^2 and the collar below corresponding to B^3 that the ring I is compelled to rise and sink

with the screw, but does not turn therewith. This collar I is provided with two pins I' I². In this modification the portion of the lever corresponding to E' is made of two thicknesses of sheet metal spread apart to form a proper fork to loosely embrace the timing-screw B. Each fork is formed with an open slot i, which receives a corresponding pin I' or I². As the screw B is turned this ring and its pins I' I² do not turn, but rise or sink. The effect is the same as with the simpler construction. The index-arm E² is carried up and down through the considerable arc required without offering any obstruction by becoming jammed and without any appreciable "lost motion." The indications on the scale are read in the same manner and with the same effect as in the other form.

Parts of the invention can be used without others.

Instead of a removable attachment the device may be a permanent attachment or the pivot E may be set in the cast-iron or other material of the machine and the other parts may be cast or otherwise produced as portions thereof.

I claim as my invention—

1. In a phonograph instrument, the separately-formed plate D and posts D' D² one carrying a graduated scale and the other a pivot,

in combination with the lever E² and means for actuating the latter, according as the speed-timing device is adjusted, all substantially as herein specified.

2. In a phonograph instrument, a speed-regulating screw arranged to serve its usual ends, in combination with a scale and with an unequally-divided indicating-lever having its short arm actuated by the longitudinal motion of said screw and its long arm moving over such scale, substantially as herein specified.

3. In a phonograph instrument the graduated scale D² in combination with the index E² carried on a separate plate D D' D² with the screw C C' for conveniently attaching and detaching, and means for actuating the index according as the timing device is moved, and means as the screw G for adjusting the supporting-pivot E of the index so that the indications may be varied as required for different instruments, all substantially as herein specified.

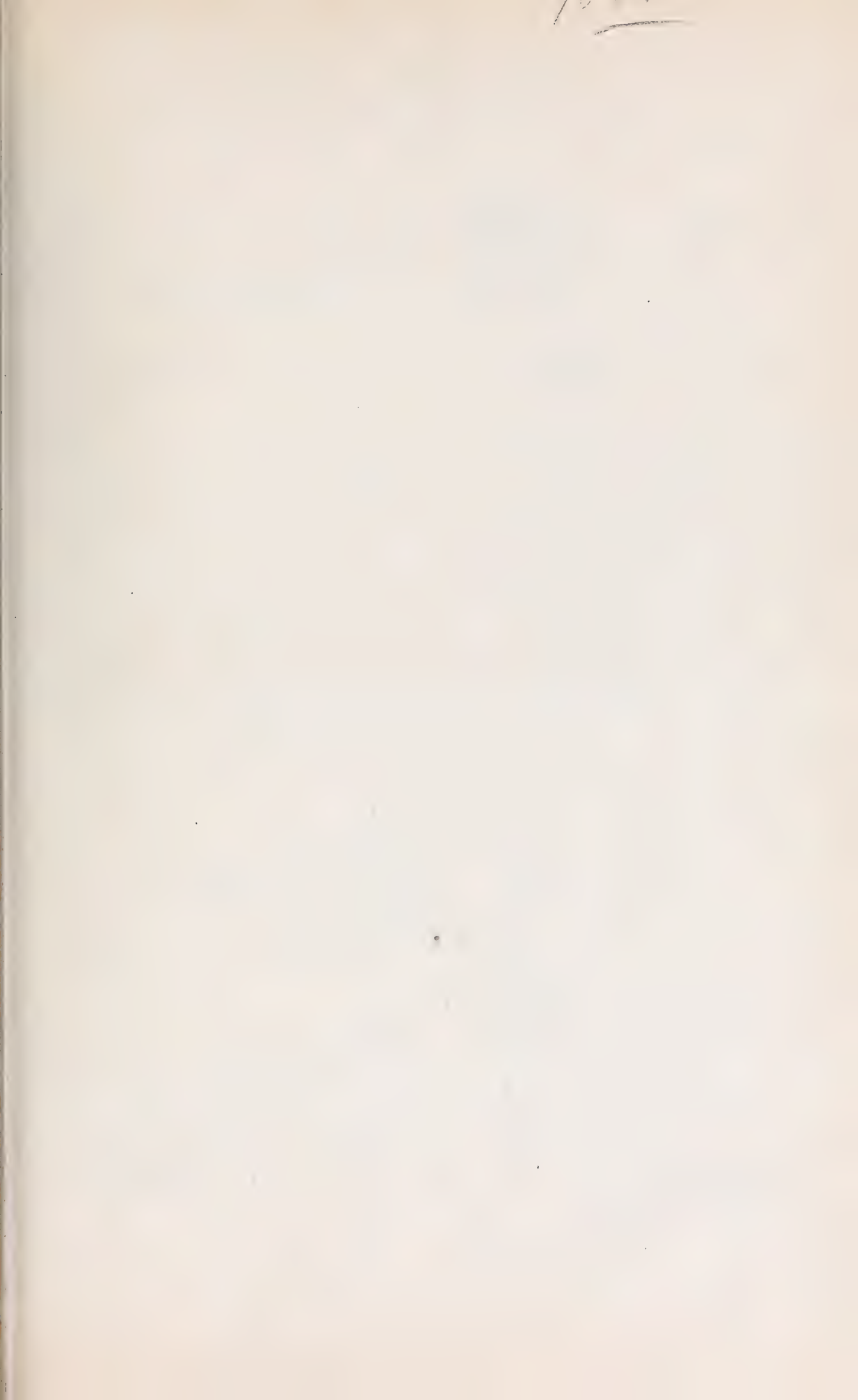
In testimony that I claim the invention above set forth I affix my signature in presence of two witnesses.

JOHN KEMMER, JR.

Witnesses:

J. B. CLAUTICE,

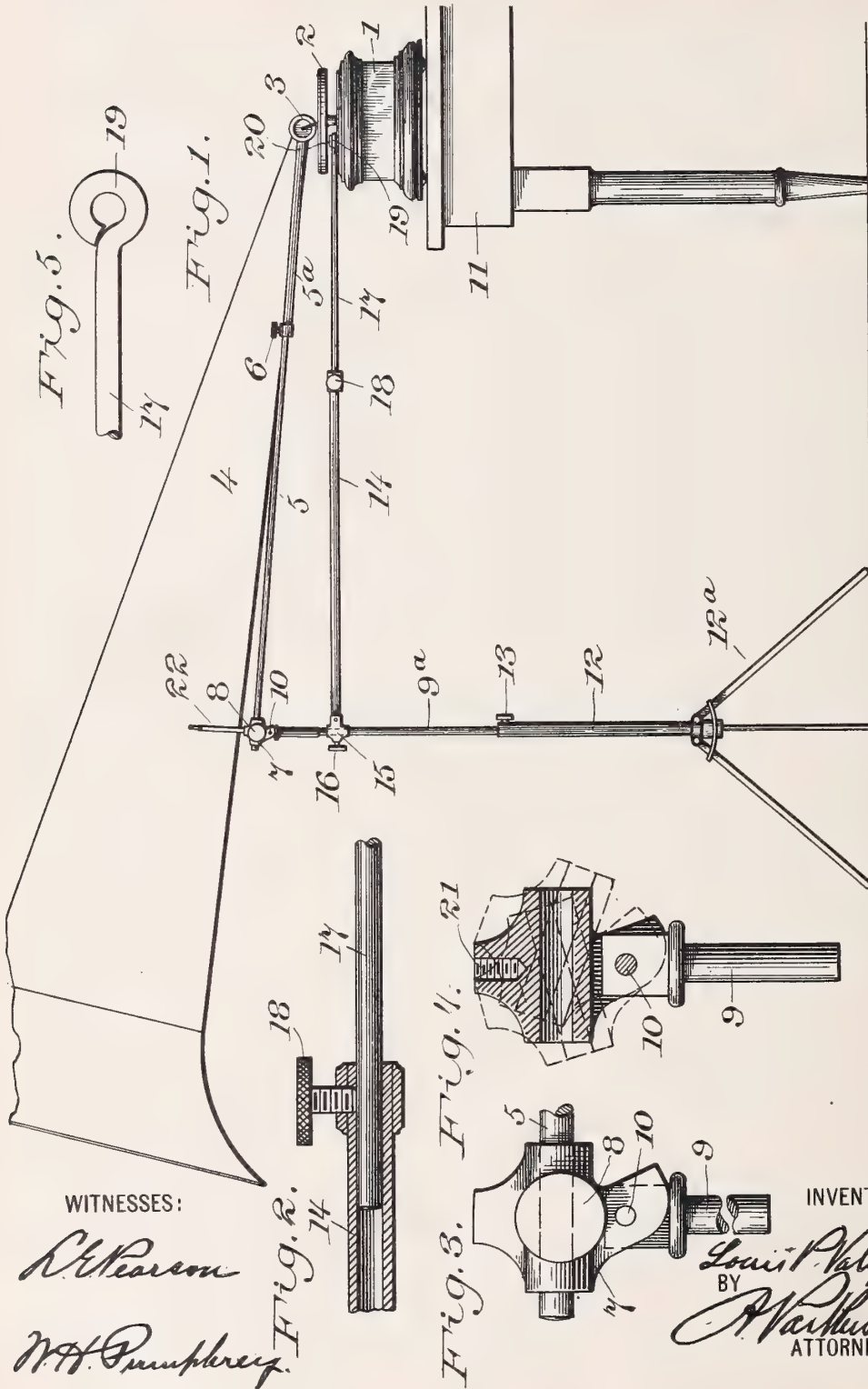
M. F. BOYLE.



L. P. VALIQUET.
TRIPOD SUPPORT FOR HORNS OF TALKING MACHINES.

(Application filed Mar. 19, 1902.)

(No Model.)



WITNESSES:

R. Pearson

W. H. Humphrey

INVENTOR

Louis Valiquet
BY
W. H. Humphrey
ATTORNEY.

UNITED STATES PATENT OFFICE.

LOUIS P. VALIQUET, OF NEW YORK, N. Y., ASSIGNOR TO UNIVERSAL TALKING MACHINE MANUFACTURING COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

TRIPOD-SUPPORT FOR HORNS OF TALKING-MACHINES.

SPECIFICATION forming part of Letters Patent No. 700,582, dated May 20, 1902.

Application filed March 19, 1902. Serial No. 98,924. (No model.)

To all whom it may concern:

Be it known that I, LOUIS P. VALIQUET, a citizen of the United States of America, and a resident of the borough of the Bronx, city, county, and State of New York, have invented certain new and useful Improvements in Tripod-Supports for Horns of Talking-Machines, of which the following is a specification.

My invention relates in general to supports for horns used with talking-machines, and more specifically consists of an adjustable supporting apparatus for very long horns, which is primarily designed for use with the zonophone or similar talking-machines using a disk-shaped sound-record. It has been customary heretofore to support such long horns by various kinds of tripods or similar apparatus; but when the ordinary form of tripod is used the vibrations set up in the various parts seriously interfere with the correctness of the sound reproduction. Moreover, the tripod with the heavy horn resting thereon is in a condition of most unstable equilibrium unless given additional lateral support, and the maintenance of an accurate adjustment of the stylus to the record during the operation of reproduction is almost impossible unless the tripod is rigidly connected to the talking-machine case. My invention overcomes these difficulties by means of a construction the preferred form of which is illustrated in the accompanying sheet of drawings, in which—

Figure 1 is a side elevation of a talking-machine, horn, and supporting apparatus. Fig. 2 is a detail, partly in section, showing the telescoping joint used in my invention. Fig. 3 is a detail of the universal joint for the swinging arm. Fig. 4 is a similar view, partly in section, and showing different positions of the parts in dotted lines. Fig. 5 is an enlarged detail of the end of the rigid arm which is fastened to the case of the talking-machine.

Throughout the several figures of drawings like reference-figures indicate like parts.

As shown in the drawings, the talking-machine 1 has a rotating-disk sound-record 2, on which rests the sound-reproducer 3 in the usual manner. To this reproducer or sound-

box 3 is attached the horn 4, which is of such length that it cannot be supported from the casing of the talking-machine in the usual manner. The sound-box 3 is carried by the swinging arm 5, having the extensible telescoping portion 5^a fastened thereto in an adjustable manner by the set-screw 6. The other end of the swinging arm 5 is preferably adjustably held in a casting 7 by the set-screw 8. This casting is hinged to the pivot-pin 9 by the horizontal pin 10, and the pivot-pin 9 being swiveled on the upper end of the rod 9^a by resting in the sleeve 23, fastened on the upper end of rod 9^a, a universal-joint mounting for the swinging arm 5 is thus provided.

The vertical rod 9^a is adjustable upward and downward according to the height of the table 11 or other support on which the talking-machine 1 rests by reason of its telescoping into the standard 12, in which it is held by the set-screw 13. The standard 12 is supported by any suitable base, such as the tripod 12^a. The fork 22, which screws into or rests in the recess 21 in the upper portion of the casting 7, supports the horn 4.

To insure proper adjustment of the parts and prevent vibration thereof, I provide the rigid arm 14, which is the main feature of novelty in the structure. One end of this arm is hinged to the casting 15, which is clamped to the vertical rod 9^a by the set-screw 16. The other end, which consists of the telescoping rod 17, held in adjustment by the set-screw 18, has the eye 19 (see Fig. 5) formed in it, by which it may be rigidly fastened to the talking-machine 1 by the set-screw 20, which is also employed to fasten the ordinary horn-supporting bracket in place when a short horn is used.

The operation of my invention is as follows: The standard 12 being set up, the extension 9^a is adjusted so as to bring the fork 22 at the proper height for supporting the horn 4. The rigid arm 14 is then fastened to the casing 1 by the set-screw 20 passing through the eye 19 and extended in a substantially horizontal position, the outer end being supported by clamping the casting 15 to the rod 9^a by the set-screw 16. The length of the

rigid arm is so adjusted by means of its telescoping section 17 that the hinge 8 comes just below the center of gravity of the horn, sound-box, and swinging arm taken as a whole when the casting 7 is in a horizontal position, as shown in full lines in Fig. 4. If tipped to either side, as shown in dotted lines, the center of gravity will fall to that side and maintain the stylus in engagement with the sound-record or hold it supported above the same. The intermeshing parts of the hinge are so shaped as to engage and prevent the sound-box from falling far enough to strike the table 11 if the stylus runs off the record. The length of the swinging arm 5^a is correspondingly adjusted by means of the sliding joint described, and the machine is ready for operation. The rigid arm 14 clamps the parts together and prevents internal vibrations. It also secures the continued proper adjustment of pivot 9 with reference to the record. The apparatus can be similarly adjusted for any length of horn and any height of table. When taken apart, the arms 5 and 14 fold down beside the standard 12, the tripod-legs 12^a fold together, the various parts telescope into one another, and the whole apparatus is in compact form for transportation.

The advantages of my invention comprise its rigidity, simplicity, adjustability, compactness, and the ease with which it may be attached to any zophonophone by simply removing the ordinary bracket and fastening the arm 14 17 in place by the same set-screw 20. Of course various changes could be made in the details of construction shown without departing from the spirit of my invention so long as the general arrangement of parts shown in the drawings or the principle of operation explained in the specification be preserved.

Having therefore described my invention, what I claim as new, and desire to protect by Letters Patent, is—

1. In a horn-supporting apparatus for talking-machines, the combination of the vertically-extending standard or support and base therefor, the horn-supporting fork, the swinging arm pivoted on said support and adapted to carry the sound-box and small end of the horn on the inner end, the rigid arm extending from the upper portion of the support and means for attaching the other end of said rigid arm to a talking-machine case.

2. In a horn-supporting apparatus for talk-

ing-machines, the combination of the vertically-extending standard or support and base therefor, the horn-supporting fork, the swinging arm pivoted on said support and adapted to carry the sound-box and small end of the horn on the inner end, the rigid arm extending from the upper portion of the support and means for attaching the other end of said rigid arm to a talking-machine, said standard being vertically extensible.

3. In a horn-supporting apparatus for talking-machines, the combination of the vertically-extending standard or support and base therefor, the horn-supporting fork, the swinging arm pivoted on said support and adapted to carry the sound-box and small end of the horn on the inner end, the rigid arm extending from the upper portion of the support and means for attaching the other end of said rigid arm to a talking-machine case, said standard, swinging arm and rigid arm being all adjustable lengthwise.

4. In a horn-supporting apparatus for talking-machines, the combination of the vertically-extending standard or support and base therefor, the horn-supporting fork, the swinging arm pivoted on said support and adapted to carry the sound-box and small end of the horn on the inner end, the rigid arm extending from the upper portion of the support and means for attaching the other end of said rigid arm to a talking-machine case, said rigid arm having a hinged connection to the vertical standard, whereby the same may be folded together when the arm is detached from the talking-machine case.

5. In a horn-supporting apparatus for talking-machines, the combination of the vertically-extending standard or support and base therefor, the horn-supporting fork, the swinging arm pivoted on said support and adapted to carry the sound-box and small end of the horn on the inner end, the rigid arm extending from the upper portion of the support and means for attaching the other end of said rigid arm to a talking-machine case, said standard, swinging arm and rigid arm being all adjustable lengthwise and detachably connected together.

Signed at New York city, New York, this 17th day of March, 1902.

LOUIS P. VALIQUET.

Witnesses:

W. H. PUMPHREY,
L. E. PEARSON.

E. R. JOHNSON.
GRAMOPHONE BRAKE.

(Application filed Aug. 8, 1900.)

(No Model.)

2 Sheets—Sheet 1.

Fig. 1.

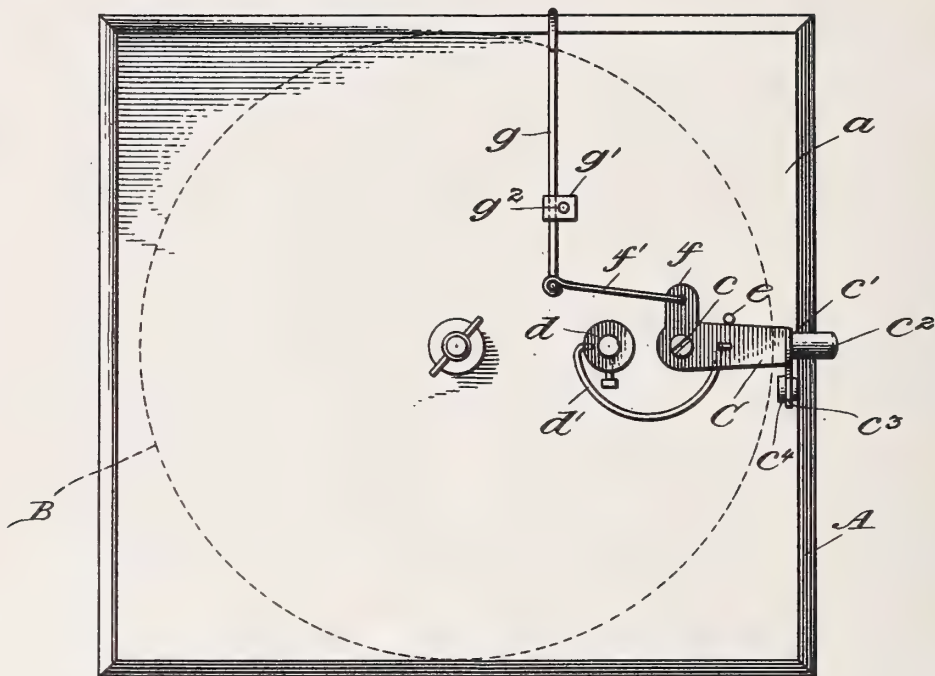
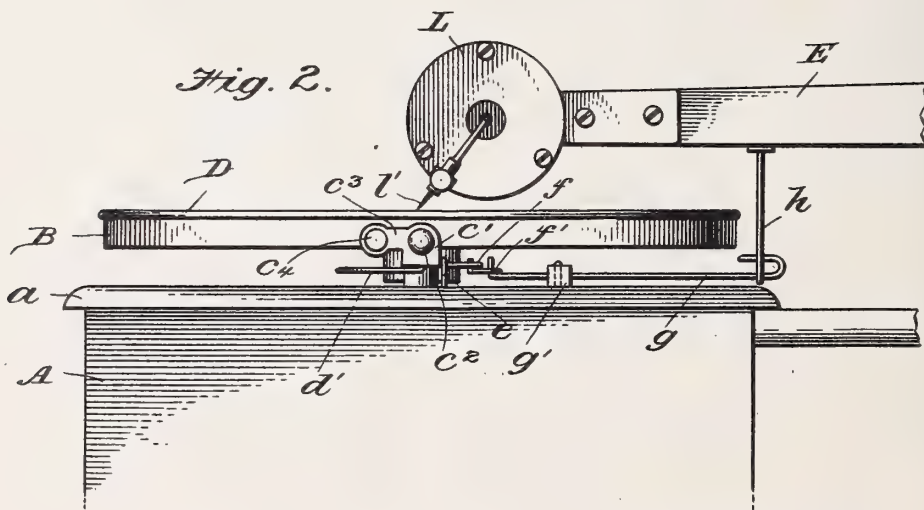


Fig. 2.



Witnesses.

Jno. F. Cross
Chas. B. Bennett

Inventor,
Eldridge R. Johnson,
by I. Stone, Petts,
his Attorney.

No. 700,937.

Patented May 27, 1902.

E. R. JOHNSON.
GRAMOPHONE BRAKE.

(Application filed Aug. 8, 1900.)

(No Model.)

2 Sheets—Sheet 2.

Fig. 3.

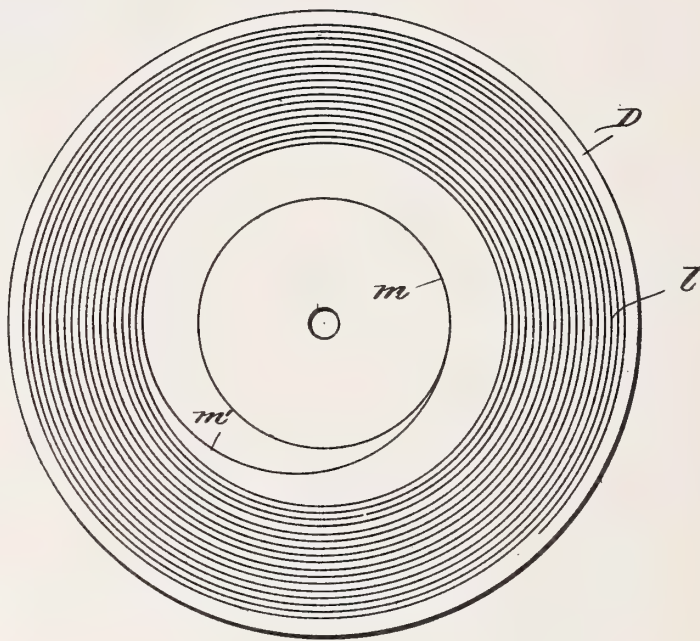
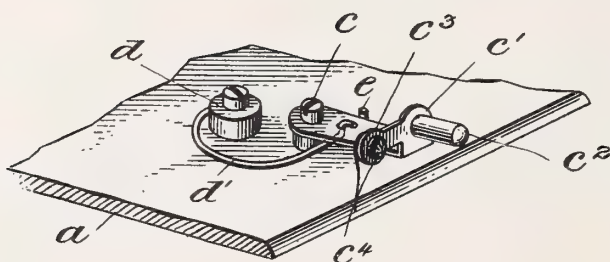


Fig. 4.



Witnesses.

Geo. F. Cross.
Chas. H. Bennett.

Inventor,

Eldridge R. Johnson,
by Horace Pellis,
his Attorney.

UNITED STATES PATENT OFFICE.

ELDRIDGE R. JOHNSON, OF PHILADELPHIA, PENNSYLVANIA.

GRAMOPHONE-BRAKE.

SPECIFICATION forming part of Letters Patent No. 700,937, dated May 27, 1902.

Application filed August 8, 1900. Serial No. 26,276. (No model.)

To all whom it may concern:

Be it known that I, ELDRIDGE R. JOHNSON, a citizen of the United States, and a resident of the city of Philadelphia, State of Pennsylvania, have invented certain new and useful Improvements in Gramophone - Brakes, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

My invention relates to an improved turn-table brake for gramophones and other sound-reproducing machines.

The principal object of my invention is to provide a simple and efficient device for stopping and holding the turn-table or record-support of a gramophone or other similar device.

A further object of my invention is to provide, in connection with the brake, means for automatically operating said brake to stop the turn-table immediately upon the completion of the reproduction.

With these objects in view my invention consists in the construction, combination, and arrangement of the parts, such as will be hereinafter fully set forth, and pointed out in the claims made hereto.

In the accompanying drawings, in which similar letters of reference are used to indicate similar parts, Figure 1 is a top plan view of a gramophone having the turn-table and reproducer removed therefrom. Fig. 2 is a side elevation of a gramophone, illustrating the turn-table and the reproducer, a portion of the reproducer-arm and its supporting-bracket being broken away and showing my improved brake mechanism in front elevation. Fig. 3 is a plan view of a sound-record, illustrating the means for shunting the reproducer-arm after its stylus-point has reached the terminus of the record-groove. Fig. 4 is a detail perspective view of the brake having the mechanism for automatically operating the same removed therefrom.

Referring to the said drawings, A designates the casing, containing a suitable motor for running the turn-table B. On the top *a* of the casing I provide a lever C, pivoted at *c* to said top, as illustrated. The free end of the lever C extends a slight distance beyond the circumference of the turn-table and is pro-

vided with an upturned end *c'*, which carries on its front face a forwardly-projecting stud *c²*, which forms a handle by means of which the brake may be operated, as will be hereinafter more fully described. Projecting laterally from one edge of the upturned portion *c'* of the lever is an arm *c³*, which has secured therein a friction-teat *c⁴*.

A short distance back of the pivotal point *c* of the lever C, I provide a lug or collar *d*, which is rigidly secured in the top plate *a* of the casing on a line with the pivotal point *c* and the center of the turn-table. A bowed spring *d'* is rigidly secured at one end in the lug *d* and has its other end loosely secured in the lever C at a point in front of its pivot *c*, and the elasticity of said spring is exerted in an inward direction, so that after it is placed in position it is always under tension. On the side of the lever C opposite the spring *d'* I provide a stop-pin *e*, which is secured in the top plate *a* of the casing and against which one edge of the lever C bears when the brake is in normal position and out of contact with the turn-table, as illustrated in Figs. 1 and 4 of the drawings.

On the side of the lever C opposite to the spring *d'* I provide an arm or lug *f*, disposed at right angles to the said lever C, and pivoted to the end of this lug is a link or rod *f'*, which is connected to an arm *g*, which is secured in a block *g'*, pivoted at *g²* to the top plate of the casing. This arm *g* projects a short distance beyond the periphery of the turn-table B and is bent up at its end, as illustrated in Figs. 1 and 2 of the drawings.

On the under side of the reproducer-supporting arm E of the gramophone I provide a downwardly-extending arm *h*, so located with respect to the turn-table as not to touch the same when the said arm is shifted laterally away from the center, but so located as to come in contact with the arm *g* after the reproducer-needle or stylus-point has reached the terminus of the record-groove.

The record-disk D has on its upper surface the spirally-arranged record-grooves *l*, adapted to be engaged during the operation of the machine with the stylus-point *l'* of the reproducer L. These grooves *l* commence at a point near the periphery of the record-disk and recede spirally toward the center of said disk,

as clearly illustrated in Fig. 3 of the drawings, and stop at a point less than half the length of the radius of the disk, the length of the grooves varying, of course, according to the length of the matter recorded. A short distance inside the terminus of the grooves *l* I provide a circular groove *m*, which is concentric with the axis of the disk. I then describe a curved groove *m'*, tangent with the terminus of the grooves *l* at one end and tangent at its other end with the opposite side of the concentric groove *m*, thus forming a continuous groove from the terminus of the spiral to the endless groove *m*. The purpose of this groove is to shunt the reproducer-arm E laterally toward the center of the disk after the stylus-point of the reproducer has completely traversed the record-grooves, so as to bring the depending arm *a* against the projecting end of the arm *g*, and thus operate the turn-table brake to stop the turn-table immediately after the completion of the reproduction.

When it is not desired to operate the brake automatically, the lever-arm *g* and connecting-rod *f'* are dispensed with, as shown in perspective in Fig. 4 of the drawings. In this figure the brake is shown in normal position and the spring remains neutral, as both of its connecting-points are on a dead-center; but as soon as the lever C is moved, so as to bring its point of connection with the spring *d'* off the dead-center, the said spring becomes active and serves to throw the said lever C to one side and bring the teat *c'*, carried by the arm *c*³, into close frictional contact with the periphery of the turn-table B and stop the revolution of same.

The operation of the automatic mechanism for throwing the brake may be described as follows: After the stylus-point of the reproducer has traversed the record-grooves it enters the tangent groove *m'*, which immediately shifts the reproducer-arm E laterally toward the center of the disk, which brings the depending arm *h* into contact with the extending end of the lever-arm *g* and shifts the same, which by reason of the link connection *f'* with the lug *f* on the brake-lever C shifts said brake-lever or throws it off of its dead-center, thus rendering the spring *d'* active and causing it to throw the arm *c*³ and its teat *c'* into frictional contact with the periphery of the turn-table, and thus stop the revolution of the said turn-table, and thereby stop the operation of the machine. When it is desired to start the machine again, the brake-lever C is thrown back into normal position by operating the handle *c*², the stop-pin *e* serving to limit the return movement of the said lever.

From the above description it will be seen that I have provided a braking device for gramophones and other machines of a similar character which is positive in its movements, strong and durable, and not liable to get out of order or lose its elasticity.

Having thus described my invention, what

I claim, and desire to secure by Letters Patent, is—

1. In a brake for gramophone turn-tables, the combination with the turn-table, of a pivoted lever secured below the turn-table adjacent the periphery thereof, a friction-teat arranged on the free end of said lever in close proximity to the periphery of the turn-table, a spring connected at one end to the pivoted lever in front of its pivot and at its other end to the casing of the machine on a dead line with its connection with the pivoted lever, substantially as described.

2. In a brake for gramophones and the like, the combination with the turn-table, of a brake-lever pivoted to the frame of the machine below the turn-table, an upturned end formed on the free end of said brake-lever, a laterally-extending arm formed on said end having a friction-teat adapted to contact with the periphery of the turn-table, a spring pivoted to the brake-lever in front of its pivotal point, and having its other end secured to the machine-frame on a dead-center with its point of attachment to the brake-lever whereby on the moving of the brake-lever the spring is brought into action and the friction-teat thrown in frictional contact with the periphery of the turn-table, substantially as described.

3. In a brake for gramophones and the like, the combination with a revolving turn-table, of a lever pivoted to the frame of the machine below the turn-table, a friction-shoe arranged on the free end of the lever in a plane with the periphery of the turn-table, a spring secured to said lever in front of its pivot having its other end secured to the machine on a dead-center with its point of attachment to the brake-lever, and means for automatically throwing said brake-lever off of its dead-center at predetermined times, for the purpose described.

4. The combination of a revoluble turn-table, a sound-record carried thereby, a record-groove formed in said record, a pivotally-mounted reproducer-support, a reproducer carried thereby, means for shunting the reproducer laterally when the end of the record-groove has been reached, a pivoted brake-lever secured below the turn-table adjacent thereto, a friction-teat arranged on the free end of said lever, a spring adapted to hold the brake-lever in normal position and means connected with the reproducer-support for throwing the brake immediately after the reproduction has been completed, substantially as described.

5. The combination of a revoluble turn-table, a sound-record carried thereby, a record-groove formed in said record, a pivotally-mounted reproducer-arm, a reproducer carried thereby, means for shunting the reproducer laterally when the end of the record-groove has been reached, a pivoted brake-lever secured below the turn-table adjacent

thereto, a friction-teat arranged on the free end of said lever, a spring connected at one end to the brake-lever in front of its pivot and at its other end to the casing of the machine on a dead-center with its point of connection with the brake-lever, and mechanism connected with the brake-lever adapted to be operated by the reproducer-arm to throw the brake immediately after the reproduction has been completed, substantially as described.

6. The combination of a revoluble turn-table adapted to support a sound-record, a pivotally-mounted reproducer-arm, a reproducer carried thereby, means for shunting the reproducer laterally when the end of the record has been reached, a pivoted brake-lever secured below the turn-table adjacent thereto, a friction-teat arranged on the free end of said lever, a spring connected at one end to the brake-lever in front of its pivot and at its other end to the casing of the machine on a dead-center with its point of connection with the brake-lever, a lever-arm pivoted to the machine-casing having one end extending beyond the turn-table periphery, a link connection between the lever-arm and the brake-lever, and means carried by the reproducer-arm for tripping the lever-arm and automatically operating the brake to stop the turn-table immediately upon the completion

of the reproduction, substantially as described.

7. The combination of a revoluble turn-table adapted to support the record, a pivotally-mounted reproducer, means for shunting the reproducer laterally when the end of the record-groove has been reached, a brake-lever pivoted to the frame of the machine below the turn-table, an upturned arm formed on the free end of said brake-lever having a friction-teat adapted to contact with the periphery of the turn-table, a spring secured to the brake-lever in front of its pivotal point having its other end secured to the machine-frame on a dead-center with its point of connection with the brake-lever, a projection, *f*, formed on the brake-lever, an arm, *g*, pivoted intermediate its length to the casing, a link connecting said arm with the lug, *f*, and a depending arm, *h*, carried by the reproducer adapted to engage the free end of the arm, *g*, after the reproduction has been completed, substantially as described.

In witness whereof I have hereunto set my hand this 3d day of August, A. D. 1900.

ELDRIDGE R. JOHNSON.

Witnesses:

JNO. T. CROSS,

LEWIS H. VAN DUSEN.

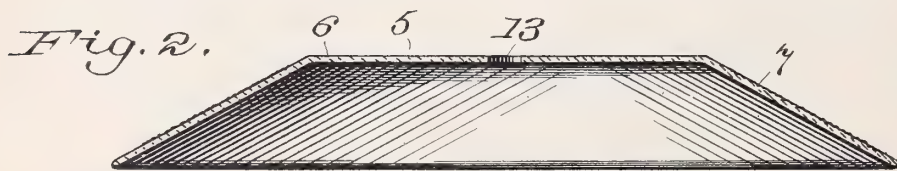
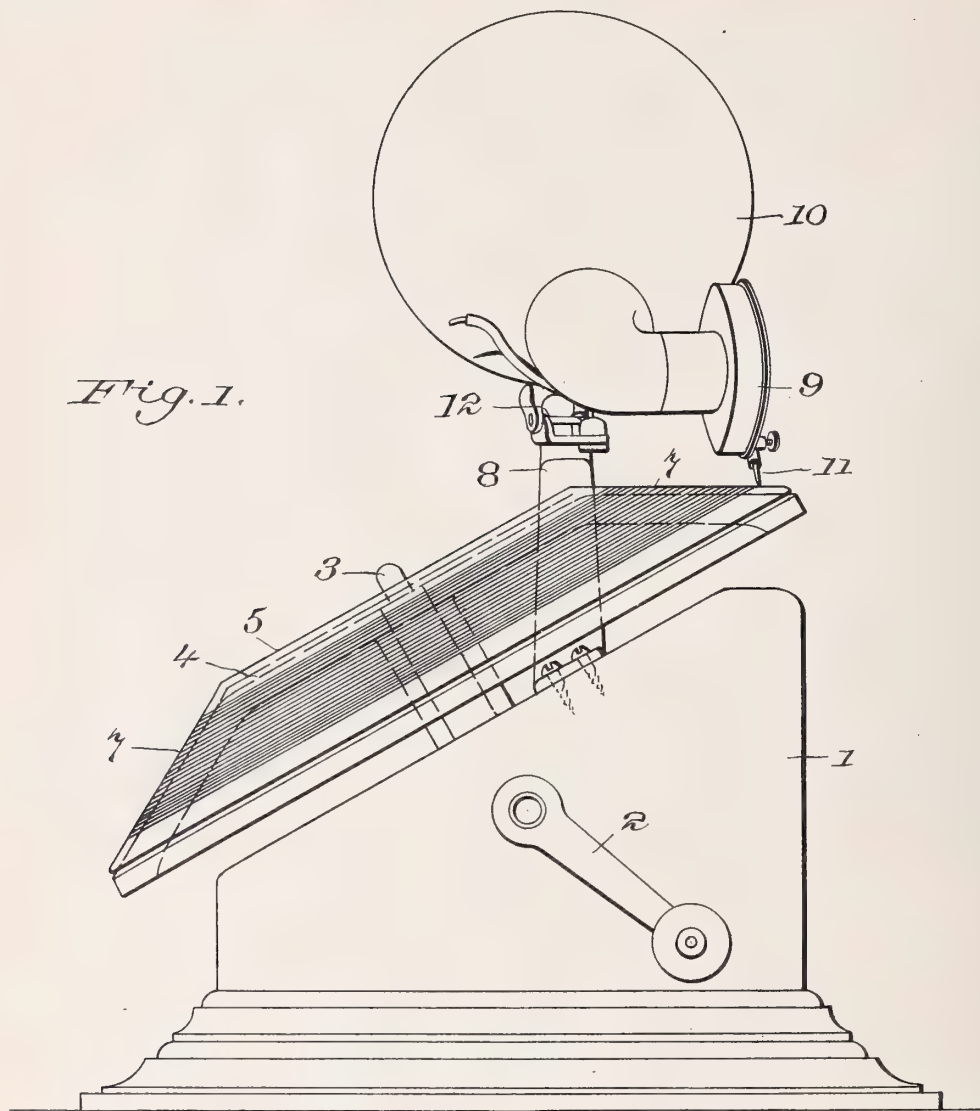


No. 701,648.

Patented June 3, 1902.

L. P. VALIQUET.
TALKING MACHINE.
(Application filed June 8, 1899.)

(No Model.)



WITNESSES:
J. H. [Signature]



INVENTOR
Louis P. Valiquet

BY

A. H. [Signature]
ATTORNEY

W. H. [Signature]

Fig. 3.

UNITED STATES PATENT OFFICE.

LOUIS P. VALIQUET, OF NEW YORK, N. Y., ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE UNIVERSAL TALKING MACHINE MANUFACTURING COMPANY, A CORPORATION OF NEW YORK.

TALKING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 701,648, dated June 3, 1902.

Application filed June 8, 1899. Serial No. 719,769. (No model.)

To all whom it may concern:

Be it known that I, LOUIS P. VALIQUET, a citizen of the United States of America, and a resident of New York city, county of New York, State of New York, have invented certain new and useful Improvements in Talking-Machines, of which the following is a specification.

My invention relates to talking-machines generally; and it consists more especially of a reproducing mechanism hereinafter claimed, the same being designed for use in connection with an improved form of sound-record plate, which latter forms the subject-matter of a divisional application filed November 16, 1901, serially numbered 82,604.

The preferred form of apparatus embodying my invention is illustrated in the accompanying sheet of drawings, in which—

Figure 1 is a side elevation of the sound-reproducing apparatus with my improved form of record on the same. Fig. 2 is a central section through the dish-shaped plate, and Fig. 3 is a similar view of a modification.

Throughout the drawings like reference-figures refer to like parts.

A motor of any convenient form, preferably a spring-motor, is inclosed in a casing 1 (the motor not being shown) and is adapted to be wound up by crank 2. This motor rotates the shaft 3, which is preferably inclined to the plane of the horizon and carries a dish-shaped table or other structure 4, on which the dish-shaped plate 5 may be fitted, the table or frame 4 fitting into the concave side of the dish-shaped plate 5. Said plate 5 has a flat central portion 6 and a curved portion 7. Said curved surface is in the shape of the curved surface of the frustum of a cone, the flat central portion 6 of the plate being in a plane at right angles to the axis of said cone, which coincides with the axis of the shaft 3.

On any suitable projection 8 from the casing 1 is mounted a reproducer 9, having the ordinary form of horn 10 and the reproducing-needle 11, adapted to engage the sound-grooves on the curved surface 7. This reproducer is hinged to the projection 8 in any suitable manner, preferably by the universal

joint 12. The record-plate has a central opening 13, large enough to fit loosely over the shaft 3.

The mode of operation of my invention is as follows: The record-grooves are stamped or cast or otherwise formed upon the curved surface 7 of the dish-shaped plate in the shape of a combined spiral and helical line having the shaft 3 as its axis. The record-plate is then placed upon the convex table 4 and immediately centers itself upon the same by reason of the conical shape of each. Preferably, of course, the reproducer 9 should move in a horizontal line, so that the power necessary to feed it across the record shall be as small as possible. Consequently the record-rotating apparatus is constructed so that the uppermost element of the conical surface 7 is parallel to the plane of the horizon—that is to say, the angle of the cone from which the frustum is cut or the angle which any element of its surface makes with its axis should equal the angle which the axis of the shaft 3 makes to the plane of the horizon. As shown, I have represented the record-plate in the shape of a frustum cut from a sixty-degree cone, and accordingly the inclination of the shaft 3 to the plane of the horizon or the base of the machine is sixty degrees also. When the record is rotated in the usual way, the needle 11 is placed in the sound-groove at the beginning of the record and is fed along by said record, although of course positive feeding apparatus could be employed, if desired. Accordingly the reproducing-needle 11 travels in a line substantially parallel to an element of the curved surface of the frustum of the cone to which the record-plate is shaped.

Some of the main advantages of my invention are as follows: The degree of frictional contact between the record-plate and the supporting-table is much greater than in the case of a flat record. Consequently no thumb-screw or other means for holding the record-plate against the table is necessary and the opening 13 might be enlarged until the flat portion 6 of the plate disappeared, as shown in Fig. 3.

It is evident, of course, that various changes

could be made in the details of construction of the apparatus illustrated without departing from the spirit and scope of my invention so long as the relative arrangement of parts or the principle of operation disclosed is preserved. Other forms of reproducer might be substituted and different arrangements of the driving-shaft and supporting-table might be employed, the angle of inclination might be varied, &c., but all such modified constructions I should still consider within the broad principle of my invention.

Having therefore described my invention, what I claim as new, and desire to protect by Letters Patent, is—

1. The combination of the record-rotating mechanism, a plate shaped like the frustum of a cone, with a web of material extending across the smaller end forming a flat central portion, and having a sound-record formed upon the curved surface thereof, and the reproducer adapted to move along a line parallel to an element of said curved surface.

2. The combination of a record-rotating mechanism having a rotating shaft inclined to the plane of the horizon, a plate shaped like

the frustum of a cone having a sound-record formed in a helical line upon the exterior curved surface thereof, the angle of the cone from which the frustum is cut being equal to the angle of inclination of the rotating shaft to the horizontal plane, said plate being carried and rotated by said shaft, and the reproducer adapted to move in a horizontal line substantially parallel to an element of the curved surface of said frustum.

3. A conically-shaped turn-table for talking-machines adapted to conically-shaped records, having that portion of the table over which the stylus travels on a substantially horizontal plane, and a rotating spindle disposed at an angle to the line of the recording-surface, and means for securing the conically-shaped record upon the turn-table, substantially as described.

Signed by me at New York city this 6th day of June, 1899.

LOUIS P. VALIQUET.

Witnesses:

LILIAN FOSTER,
W. H. PUMPHREY.

No. 701,649.

Patented June 3, 1902.

L. P. VALIQUET.
TALKING MACHINE.
(Application filed Nov. 16, 1901.)

(No Model.)

Fig. 1.



Fig. 2.

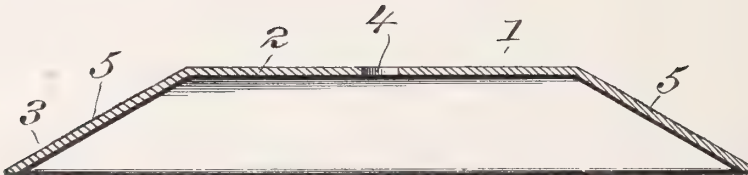
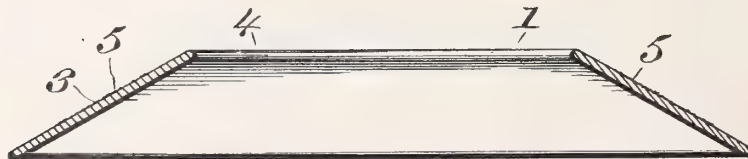


Fig. 3.



WITNESSES:

L. Pearson
W. H. Humphrey,

INVENTOR

Louis P. Valiquet

BY

A. Van Renswilde
ATTORNEY

UNITED STATES PATENT OFFICE.

LOUIS P. VALIQUET, OF NEW YORK, N. Y., ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE UNIVERSAL TALKING MACHINE MANUFACTURING COMPANY, A CORPORATION OF NEW YORK.

TALKING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 701,649, dated June 3, 1902.

Original application filed June 8, 1899, Serial No. 719,769. Divided and this application filed November 16, 1901. Serial No. 82,604. (No model.)

To all whom it may concern:

Be it known that I, LOUIS P. VALIQUET, a citizen of the United States of America, and a resident of the city of New York, county of New York, State of New York, have invented certain new and useful Improvements in Talking-Machines, of which the following is a specification.

My invention relates to talking-machines generally; and it consists more especially of an improved form of plate or body, as herein-after claimed, in which the grooves containing the undulations or other variations corresponding to the undulations of the sound-waves are formed, the same being a division of my pending application filed June 8, 1899, and serially numbered 719,769.

Heretofore two general types of blanks have been employed in which the sound-record groove is formed. These two general forms are the cylinder and the flat disk. Each has its advantages and disadvantages. The cylindrical form is less liable to warp out of shape, and the surface speed of the record while being rotated is the same at all points. The disadvantages, however, of this form are that it is bulky and difficult to pack in shipping and cannot have the record-grooves conveniently stamped or cast upon it. Consequently in the majority of cases each copy of the record has to be cut or otherwise formed by a tool traveling over the surface of each particular blank. The advantages of the disk-shaped or flat record are that it takes up little space, can readily be stamped or cast from a matrix or die of harder material, and can bear upon its face the title of the composition recorded upon it, together with the signature of the performer, if desired. The disadvantages, however, of the disk-shaped record are that it is liable to warp slightly out of shape, which requires the employment of compensating mechanism in the reproducer, and that as the record has a plate that is rotated about an axis perpendicular to its face the surface speed of points at different radii from the axis varies. As a result the undulations produced by sounds of the same pitch are longer in the outer curves of the spiral

formed by the record-groove than they are in the inner curve of said spiral, and as a result practically only a portion of the face of the plate nearest the outer circumference is valuable for record-making purposes. My invention combines the advantages of both these forms of record and avoids most of the disadvantages of each form. Its essential feature is the forming of the record-groove on the curved surface of a plate shaped in the form of a frustum of a cone.

The preferred form of record-plate embodying my invention is illustrated in the accompanying sheet of drawings, in which—

Figure 1 is a side view in elevation of my improved form of sound-record plate. Fig. 2 is a central section through the dish-shaped plate. Fig. 3 is a similar view of a modification.

Throughout the drawings like reference-figures refer to like parts.

1 represents the sound-record plate, the same being in form of a dish-shaped shell and having a flat central portion 2 and a surrounding curved portion 3. The portion 3 of the plate conforms to the curved surface of the frustum of a cone, the flat central portion being in a plane at right angles to the axis thereof. The plate 1 is designed for use with any convenient form of motor-driven turntable—such, for example, as that disclosed in my pending application, above referred to—the same having the motor-shaft inclined to the plane of the horizon and the turn-table carried thereby conically shaped to fit into the concave side of the dish-shaped sound-record plate. Centrally of the record-plate an opening 4 is formed to fit loosely over the end of the motor-shaft, which ordinarily projects above the turn-table. The record-grooves 5 are stamped or cast or otherwise formed upon the curved surface of the dish-shaped plate in the shape of a combined spiral and helical line.

Preferably, of course, the record-plate should be mounted to rotate so that the reproducer may travel in a horizontal plane, thereby reducing the power necessary to feed it across the record as much as possible. The parts

may be thus operatively combined by constructing the record-rotating apparatus so that the uppermost element of its conical surface shall be parallel to the plane of the horizon. To accomplish this, the angle of the cone from which the frustum is cut—that is to say, the angle which any element of its surface makes with its axis—should be equal to the angle which the axis of the motor-shaft makes to the plane of the horizon. As shown, I have represented the record-plate in the shape of a frustum cut from a sixty-degree cone, and accordingly the inclination of the motor or turn-table shaft to the plane of the horizon or the base of the machine is sixty degrees also.

When the record is rotated in the usual way, the needle of the reproducer is placed in the sound-groove at the beginning of the record and is fed along by said record, although, of course, positive-feeding apparatus could be employed, if desired. Accordingly the reproducing-needle travels in a line substantially parallel to an element of the curved surface of the frustum of the cone to which the record-plate is shaped.

The advantages of my invention comprise the following: The angle of the cone being made sufficiently obtuse, the copies of the record could be stamped or cast by a die or mold and disengaged therefrom with the same freedom as in the case of a flat record. The record-plate having the form shown is so braced that it cannot warp or twist to any appreciable degree. The record-plate immediately and automatically centers itself upon the supporting-table. The degree of frictional contact between the record-plate and the supporting-table is much greater than in the case of a flat record. Consequently no thumb-screw or other means for holding the record-plate against the table is necessary, and the central opening 4 might be enlarged until the flat portion 2 of the plate disappeared, as shown in Fig. 3. A large number of commercial records can be packed together in very nearly as small a space as the same number of flat

records could be packed, the various plates fitting into one another like a series of saucers. The difference in radii of the first loop of the spiral groove and the last loop of said spiral groove is less than would be the case in a flat record of the same length impressed upon a flat plate of the same diameter. This difference may of course be still further reduced by making the cone of a more acute angle. A sufficient space is still left at the center of the dish-shaped record for carrying the title of the composition and the signature of the performer.

It is evident, of course, that various changes could be made in the details of construction of the apparatus illustrated without departing from the spirit and scope of my invention, so long as the relative arrangement of parts or the principle of operation disclosed is preserved.

Having therefore described my invention, what I claim as new, and desire to protect by Letters Patent, is—

1. As an article of manufacture, a sound-record in the shape of a frustum of a cone with a web of material extending across the smaller end forming a flat central portion, the record-grooves being formed in the curved surface of said frustum.

2. As an article of manufacture, a sound-record in the shape of a frustum of a cone, with a web of material extending across the smaller end forming a flat central portion, the record-grooves being formed in the curved surface of said frustum in a helical line about the axis of said frustum.

3. As an article of manufacture, a dish-shaped sound-record having record-grooves formed on the outer curved surface of the cone-shaped portion.

Signed at New York, N. Y., this 27th day of September, 1901.

LOUIS P. VALIQUET.

Witnesses:

W. H. PUMPHREY,
L. E. PEARSON.

70-1.677

E. P. FELT.
GRAPHOPHONE.

(Application filed July 15, 1901.)

(No Model.)

2 Sheets—Sheet 1.

FIG. 1.

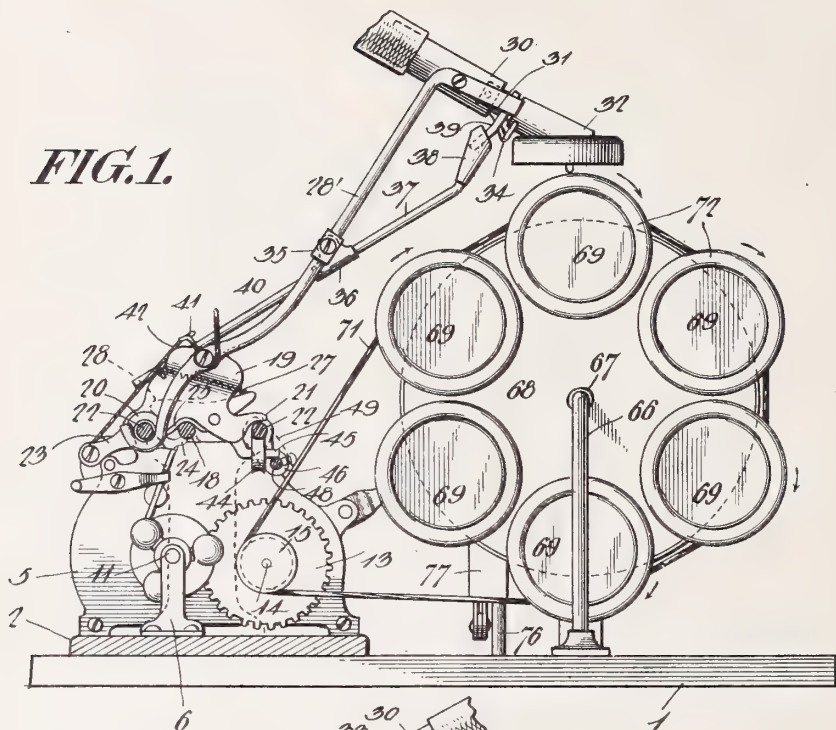
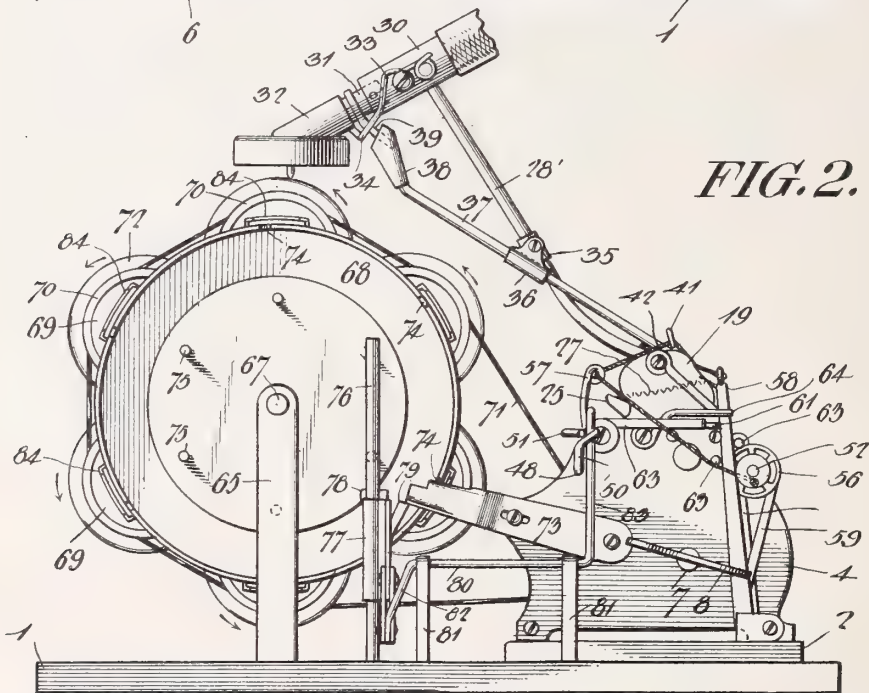


FIG. 2.



Witnesses

Frank C. Culverwell,
Chas. S. Hoyer.

Erick Person Felt, Inventor.
by *C. A. Snow & Co.* Attorneys

E. P. FELT.
GRAPHOPHONE.

(Application filed July 15, 1901.)

(No Model.)

2 Sheets—Sheet 2.

FIG. 3.

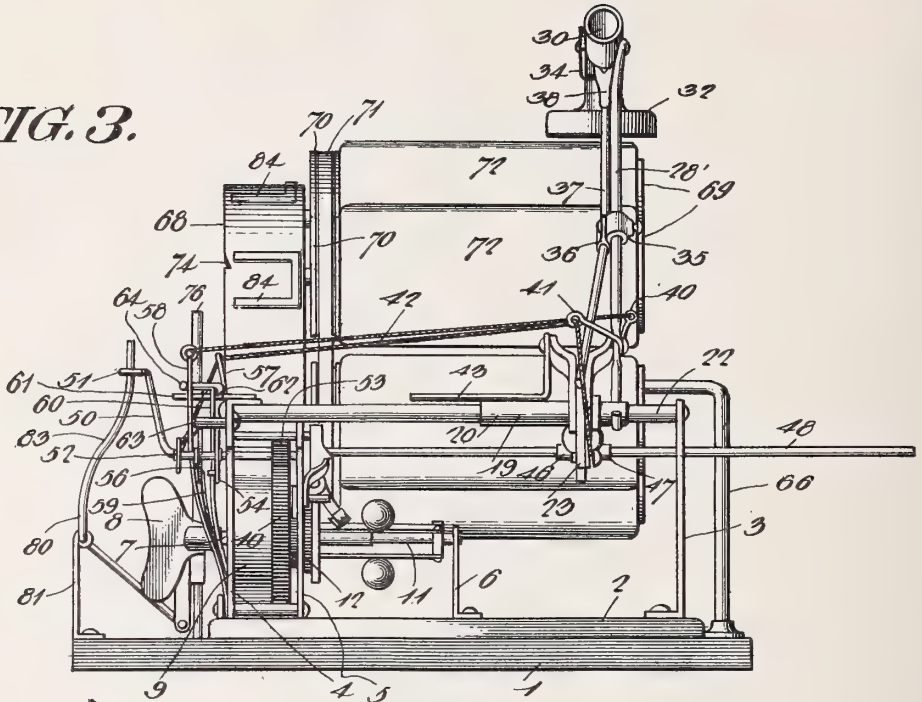


FIG. 4.

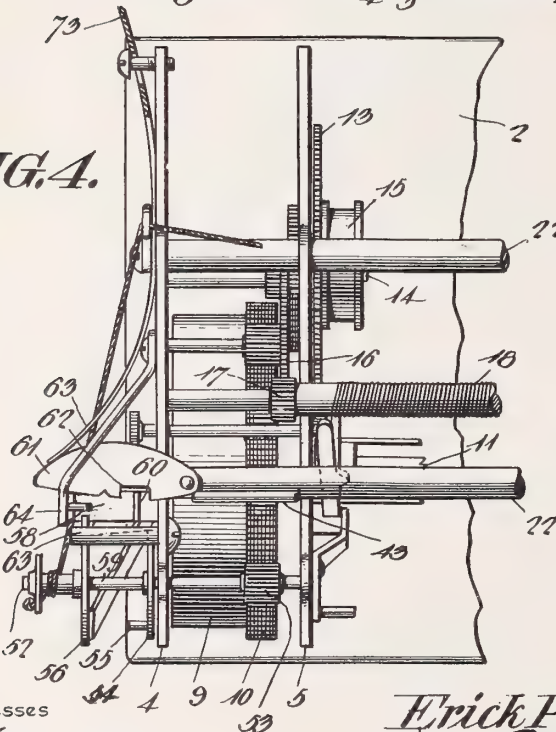
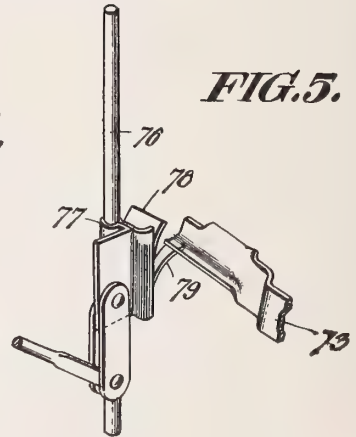


FIG. 5.



Witnesses

Frank Culverwell.
Chas. S. Hoyer.

Erick Person Felt, Inventor.
by *C. Snow & Co.* Attorneys

UNITED STATES PATENT OFFICE.

ERICK PERSON FELT, OF ALIDA, MINNESOTA, ASSIGNOR OF ONE-HALF TO
CHARLES HENRY MILES, OF BEMIDJI, MINNESOTA.

GRAPHOPHONE.

SPECIFICATION forming part of Letters Patent No. 701,697, dated June 3, 1902.

Application filed July 15, 1901. Serial No. 68,364. (No model.)

To all whom it may concern:

Be it known that I, ERICK PERSON FELT, a citizen of the United States, residing at Alida, in the county of Beltrami and State of Minnesota, have invented a new and useful Graphophone, of which the following is a specification.

This invention relates to graphophones, and particularly to means for supporting a plurality of record-cylinders and successively bringing said cylinders into proper position under the stylus through the actuation of a motor solely and without manual operation; and the purpose of the invention is to produce a graphophone wherein the matter from a number of records may be reproduced, the stylus and reproducer disengaged from operative relation to the records at the terminal of the latter in an automatic manner and returned to a starting position, and a motor device for controlling such operations having in connection therewith certain cooperating devices which are proportioned and arranged to carry out the several operations desired.

The invention consists in the construction and arrangement of the several parts, which will be more fully hereinafter described and claimed.

In the drawings, Figure 1 is a transverse vertical view through the improved graphophone with the carriage and the parts carried thereby arranged at a starting-point in relation to the records. Fig. 2 is a left end elevation of the improved device. Fig. 3 is a front elevation of the same. Fig. 4 is a top plan view of a portion of the device. Fig. 5 is a detail perspective view of a portion of the shifting mechanism for the record-carrier.

Similar numerals of reference are employed to indicate corresponding parts in the several views.

The numeral 1 designates a suitable base, which may be a portion of a casing on which the improved device is disposed, and on the front portion thereof is secured a base-plate 2, having a standard 3 rising from one end and a pair of separated upright plates at the opposite end, (indicated by the numerals 4 and 5,) and at a suitable distance from the inner plate 5 is a bearing upright 6. Between the plates 4 and 5 a spring-actuating device

is held on a winding-shaft 7, the latter being supplied with a suitable key or similar device 8 for winding the spring device, said spring device being held in a casing 9, which rotates therewith and has a gear 10 secured thereto. A shaft 11, provided with a suitable speed-regulating and starting or releasing and stopping devices, is actuated by the said spring device, and said shaft has thereon a pinion 12, which meshes with a spur-gear 13, fixed to a drive-shaft 14 in rear of the said shaft 11 and also provided with a flanged band wheel or pulley 15. The spring device or motor may be of any suitable form, and with the exception of the parts which will be specifically referred to in conjunction with certain novel mechanisms any preferred form of such motor may be employed, and at times an electric motor embodying the same specific features may be equally well used. The shaft 14 is operated by suitable gearing in part thereon between the plates 4 and 5 and in part actuated by the motor, the latter including in its organization compensating gearing to prevent too rapid run off of the spring, the speed controlling or governing mechanism on the shaft 11 also contributing largely to the attainment of this desirable result. The said motor also includes a gear 16, that meshes with a pinion 17 on a screw feed-rod 18, having bearing, respectively, in the upper portion of the outer plate 4 and of the standard 3 for the purpose of feeding the carriage 19, having guide devices 20 and 21 engaging guide-rods 22, terminally secured to the outer plate 4 and the standard 3, and between which the said screw feed-rod is located.

The carriage 19 has a release-arm 23 fulcrumed on the front guide device 20, with an outer weighted extremity to cause it to gravitate and throw the inner terminal 24 upwardly against the under portion of the screw feed-rod 18, and between the two upwardly-projecting supports of the carriage a feeding-grip 25 is pivotally mounted and has a lower concave recess 26, with a wall reduced to an edge to take into the threads of the rod 18, so that the carriage will be regularly fed over the said rod. The grip is pivoted near its rear extremity and has a spring 27 secured to the latter and to a portion of the carriage-sup-

ports near the front, said grip having a forwardly-extending member 28 between the carriage-supports for contact with a part of the arm 23 when the latter is elevated to thereby release the said grip and permit the carriage to slide back to a starting-point. The inner terminal 24 of the arm 23 does not fully extend across the under portion of the screw feed-rod 18; but said terminal has a projection across the under portion of the rod 18 only for such distance as to prevent loose movement or impositive action of the reduced edge of the feeding-grip 25 in relation to the said rod 18, and when the outer end of the arm 23 is elevated by the means which will be hereinafter explained the said terminal 24 will be drawn downwardly and outwardly away from the rod 18. A rigid support 28' rises from the carriage and has a rearward inclination, and to the upper end thereof a sound-conveying tube 30 is secured and held at a downward inclination, so that the front end thereof will be raised for the attachment of a tube or horn. In the rear end of the said tube 30 a coupling-tube 31 is pivotally mounted, and thereto the reproducer 32 is secured, the said tube 30 also having a spring-arm 33 secured thereto and provided with a rear depending transverse member 34 to serve as a cushion for a purpose which will presently appear. On the support 28' a clamp-collar 35 is adjustably mounted and carries an upwardly and rearwardly inclined guide 36, in which a slide-rod 37 is mounted, and has an upper terminal socket 38 to receive and operate in conjunction with a depending projection 39 from the coupling-tube 31. The lower extremity of the slide-rod 37 is held between the supports of the carriage and has its terminal in such forward position as to be engaged by the arm 23 when the latter is raised and push the slide-rod 37 upwardly. The upward movement of the slide-rod causes the upper terminal socket 38 to contact with the depending member 34 of the arm 33, and said member is brought into contact with the adjacent portion of the reproducer to raise the latter out of operative contact with the records. The weight of the reproducer is such that when the slide-rod is free to return to its normal position said reproducer will gravitate and depress the slide-rod, and thus reset the several devices for a subsequent elevating operation, as just explained. The carriage also has a wire post 39' or the like, to which a clutch cord or wire 40 is secured and runs to the left of the machine, and also attached to said carriage is a guide-eye 41, through which a cord 42 passes and is secured to the front weighted extremity of the arm 23, said cord 42 likewise extending to the left end of the machine. The carriage also has a trip-rod 43 extending from the front portion thereof a predetermined distance toward the left end of the machine, and depending from the rear guide device 21 of said carriage is a grooved roller 44, which bears against the under portion of the

rear guide-rod 22 to steady the movement of the carriage, the bearing 45 for said roller being rearwardly extended and caught between two adjustable set-collars 46 and 47 on an adjacent shifting rod 48, slidably mounted in the plates 4 and 5 and in a bearing-strip 49, projecting from the upper rear portion of the standard 3. The said rod 48 projects some distance beyond the left end of the machine and has an upward deflection 50, with an upper terminal horizontal loop 51.

At the upper front portion of the left end of the machine a short drum-actuating shaft 52 is mounted and operated by the motor through the medium of a pinion 53 thereon meshing with the gear 10, and on the extremity of the said shaft, close to the outer side of the plate 4, a clutch-disk 54 is secured and has an outwardly-projecting pin or projection 55 to engage the adjacent head of a winding-drum 56, loosely mounted on the outer extremity of said shaft 52. The cord 42 from the arm 23 of the carriage passes through a rear upwardly-projecting eye or guide 57, supported by the outer plate 4, and then runs to the drum 56 for winding or unwinding purposes, in accordance with the movement of the carriage. The cord or wire 40 is secured to the upper end of a spring shifting arm 58, secured to and located outside of the plate 4, the said arm engaging the inner head of the drum 56 when the cord or wire 40 is drawn taut to shift said drum into operative engagement with the disk 54 to cause the drum to rotate, the drum being moved toward the disk against the repellent action of a spring 59, secured to the plate 4 and operating to throw the drum out from the said disk when free to do so. It will be seen that when the drum is in engagement with the disk the shaft 52 rotates said drum to wind the cord 42 thereon, and by this means the carriage is returned to its normal position or starting-point. An unshipping-arm 60 is movably attached to the outer side of the plate 4 and is substantially in alignment with the arm 58 and is adapted to bear against the inner face of the inner head of the drum to throw the latter positively outward from the disk 54 and is engaged by the end of the rod 43. On the upper edge of the plate 4 is a horizontally-disposed pivoted latch 61, having a notch 62 in the front edge thereof and held in normal forward position by a spring 63 engaging the back edge thereof. When the carriage travels its full limit to the right, the wire or cord 40 pulls the arm 58 inwardly or toward the right into the said notch 62 of the latch 61, and the arm 58 also pushes the arm 60 inwardly therewith. The arms 58 and 60 remain in this locked position until the end of the rod 43 first strikes against the outer edge of the latch and releases the latter by pressing it back from the arms 58 and 60, and the latter being resilient are free to fly outwardly from the plate 4, the arm 60 in this movement engaging the

inner face of the inner head of the drum and is positively pressed outwardly by the rod 43. The arms 58 and 60 operate between outwardly-extending guide-pins 63, and the outward throw or movement of the arm 58 is limited by a stop-arm 64, projecting outside of the same.

In rear of the plates 4 and 5 and the carriage operating and supporting devices just described are a pair of bearing-standards 65 and 66, which support a longitudinally-extending spindle 67, having a rotatable head or disk 68 mounted thereon close to the left standard 65 and constructed of any material adapted for the purpose. The head or disk 68 carries a plurality of longitudinally-disposed cylinders 69, which are individually and independently rotatable and spaced apart from each other, the left ends of the cylinders having circumferentially-grooved heads 70 engaged by a belt 71 from the band wheel or pulley 15 of the shaft 14. These cylinders are adapted to removably receive wax or analogous records or tablets 72 and are so disposed in relation to the reproducer that when the latter is lowered into operating position it will contact with the record or tablet at the highest central point or that one which has its vertical diameter in alinement with the similar diameter of the said head or disk 68. The several cylinders and records or tablets will be successively brought up into this position by the step-by-step rotation of the head or disk 68, the latter and the cylinders and records moving in the direction of the arrows shown by Fig. 1. To prevent the head or disk 68 from having an impositive position after adjustment, so as to avoid injury to the records and also to cause a reproduction with accuracy and clearness, a spring-arm 73 projects rearwardly from the plate 4 and has a portion of the upper edge of the rear extremity thereof always in engagement with one of a series of notches 74 in the outer perimeter of the said head or disk 68, and on the same side or face of the latter near the center are a plurality of outwardly-projecting pins or studs 75 in circular alinement and corresponding in number to the number of cylinders carried by the head or disk. Close to the outer side of the head or disk and rising from the base is an upright rod 76, having a vertically-operating slide-pawl 77 thereon and provided with an inner upstanding lip 78 to engage the pins or studs 75, and projecting forwardly from the inner portion of the pawl is a trip-finger 79 to slip between the rear extremity of the spring-arm 73 and the outer side of the said head or disk 68 to disengage the said latter arm extremity from the notches 74 just in advance of the engagement of the individual pins or studs 75 by the lip 78 of the said slide-pawl. The movement of the said pawl is so timed by predetermined calculation that when it reaches the upper limit of its stroke the successive cylinders will be brought up to the highest plane and in position to bring

the reproducer in proper relation to the records or tablets thereon. The pawl 77 is operated by a crank-lever 80, movably held by upstanding bearing-arms 81, the said lever being provided with an inwardly-extending rear arm 82 and a front outwardly-projecting arm 83. The rear arm 82 is movably attached to the lower end of the said pawl 77, and the front arm loosely extends upwardly through the loop 51 of the shifting rod 48. As the latter rod is drawn to the right by the movement of the carriage the front arm 83 of the crank-lever 80 is drawn over to the right to fully lower the pawl 77 into position to engage the adjacent stud or pin 75 next in succession, and when the carriage has reached the limit of its movement and the stylus of the reproducer has fully traversed the record on the cylinder in position thereunder the arm 23 of the carriage is fully drawn up, the grip released, so the carriage is free to return over the feed screw-rod, and the reproducer raised, and at the same time the winding-drum 56 is thrown into operation and winds the cord 42 thereon. By this winding operation the cord draws the carriage to the left, and the shifting rod 48 is likewise drawn to the left and gradually turns the arm 83 of the crank-lever 80 outwardly, and consequently raises the arm 82 of said lever and elevates the pawl 77 to turn the head or disk 68 a sufficient distance to bring the successive cylinder and record into maximum elevated position. Just as this adjustment of the record occurs the arm 23 will have been released, the reproducer allowed to descend to normal position to bring the stylus in place on the new record, and the winding-drum 56 released and permitted to run loose to permit the carriage to again be fed toward the right. During this operation the motor is in continual motion and will continue to actuate the parts until run down or manually stopped, and by this means the matter carried by the several records or cylinders will be successively reproduced without manual attention or adjustment. The number of cylinders carried by the head or disk 68 can be varied at will and the wax or like records slipped thereover and carried thereby can be replaced when desired. It is also proposed to provide the rim of the head or disk 68 with suitable card-holders 84, which will be arranged directly opposite the several cylinders, as shown, to designate the character of the records.

The improved device will be found convenient and entertaining, and the parts will be inclosed in a case, as usual in this class of devices, so as to render them suitable for public use, and, moreover, it is intended to have the usual coin-controlled starting mechanism at times in connection therewith and suitable automatic stopping mechanism, so that when the full complement of records have been reproduced the machine will be stopped. It is also obvious that changes in the form, size, proportions, and minor details may be made

without departing from the principle of the invention.

Having thus described the invention, what is claimed as new is—

5 1. In a machine of the class set forth, the combination of a plurality of unitedly and individually rotatable record-holders, a carriage carrying a movably-mounted reproducer and also provided with a movable grip, a feed
10 screw-rod engaged by the carriage, a gravitating arm pivoted to the front portion of the carriage and operating to release the grip when elevated, a slide-rod cooperating with the reproducer to raise the latter and with
15 which said arm has contact, a cord connected to said arm, a winding-drum for said cord, a motor for actuating the several parts including the said drum, and means for shipping and unshipping the said drum.

20 2. In a machine of the class set forth, the combination of a plurality of unitedly and individually rotatable record-holders, a carriage supporting a movably-mounted reproducer and provided with a movable grip, a
25 feed screw-rod for the carriage, a gravitating arm operative to release the grip, a slide-rod cooperating with the reproducer to raise the latter and with which said arm has contact, a motor for actuating the several parts, and
30 means for automatically raising the arm, returning the carriage to a starting position after traveling its full limit over the several records, and permitting the arm to resume its normal position.

35 3. In a machine of the class set forth, the combination of a plurality of unitedly and individually rotatable record-holders, a carriage supporting a movably-mounted reproducer, a slide-rod cooperating with the reproducer to raise the latter, a pivoted arm adapted
40 to engage the lower end of and move the said rod, a motor, and automatically-operating means for shifting the said arm to raise the reproducer and permit the rod to return
15 to normal position during extreme opposite positions of the carriage.

4. A machine of the class set forth, comprising a plurality of unitedly and individually rotatable record-holders, a carriage having an
50 automatically-movable reproducer, a motor for actuating the carriage and the holders, a drum-shaft operated by the motor and provided with a clutch device, a drum loosely mounted on the said shaft and adapted to be
55 rotated with the latter by engagement with the clutch device, a resilient arm for moving the drum into engagement with the clutch device provided with a flexible connecting device running to the carriage, a resilient releasing-arm for the drum, a latch to engage
60 said arms and a trip-rod carried by and movable with the carriage to engage said latch to release the arms and to push the releasing-arm to free the drum.

65 5. A machine of the class set forth, comprising a plurality of unitedly and individually

rotatable record-holders, a carriage having an automatically-movable reproducer and a gravitating arm, a motor for actuating the carriage and the holders, a winding-drum adapted
70 to be actuated by the motor and capable of being thrown into and out of engagement with the motor, resilient arms for moving the drum into and out of operative engagement with relation to the motor, a flexible connection
75 between the arm for moving the drum into operative engagement with the motor and the carriage, a cord between the arm of the carriage and the drum, a feed screw-rod engaged by the carriage, a spring-actuated
80 grip in the carriage, the arm of the carriage operating when elevated to release the said grip and raise the reproducer, and a trip-rod secured to and movable with the carriage to release the drum from operative engagement
85 with the motor.

6. In a reproducing-machine of the class set forth, the combination with a plurality of rotatable record-holders, of a motor operating a band-pulley, a belt engaging the holders at one end and adapted to continuously
90 rotate the same and also passing over said band-pulley, a series of records adapted to be mounted on the holders, a reproducer, a carriage supporting the same, means for reciprocating the carriage to traverse the reproducer longitudinally of a record, means
95 for returning the carriage to initial position, and means for stopping the records successively in such position as to permit of the actuation of the reproducer.

7. In a machine of the class set forth, the combination of a plurality of rotatable record-holders, a motor for actuating said holders, a screw feed-rod, a carriage movable over
105 said feed-rod and having a pivoted spring-actuated grip to engage the latter, a gravitating arm mounted in the carriage and adapted to contact with a portion of the grip to release the latter, a reproducer supported by the carriage, and means for automatically raising
110 the arm when the carriage reaches its limit of movement in one direction and starts to return to an opposite extreme position.

8. In a machine of the class set forth, the combination of a plurality of rotatable record-holders, a carriage supporting a movable reproducer, a motor for actuating the holders and carriage, a disk carrying the holders and having outer projecting devices and notches,
120 a spring-arm to engage the notches of the disk, a vertically-slidable pawl to engage the said projecting devices provided with a trip-finger to release said arm, a crank-lever connected to the pawl, and a shifting rod movable by the carriage and having one end loosely engaging the one extremity of the crank-lever.

9. In a machine of the class set forth, the combination of a plurality of rotatable record-holders, a carriage supporting a movable reproducer, a motor for actuating the holders
130

and carriage, a vertically-movable slide-pawl for bringing the successive holders into operative position with relation to the reproducer, and a shifting rod engaged by a portion of the carriage and movable by the latter to impart reverse movements to the said pawl.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

ERICK PERSON FELT.

Witnesses:

WM. P. WELCH,
THOS. MCCARTHY.



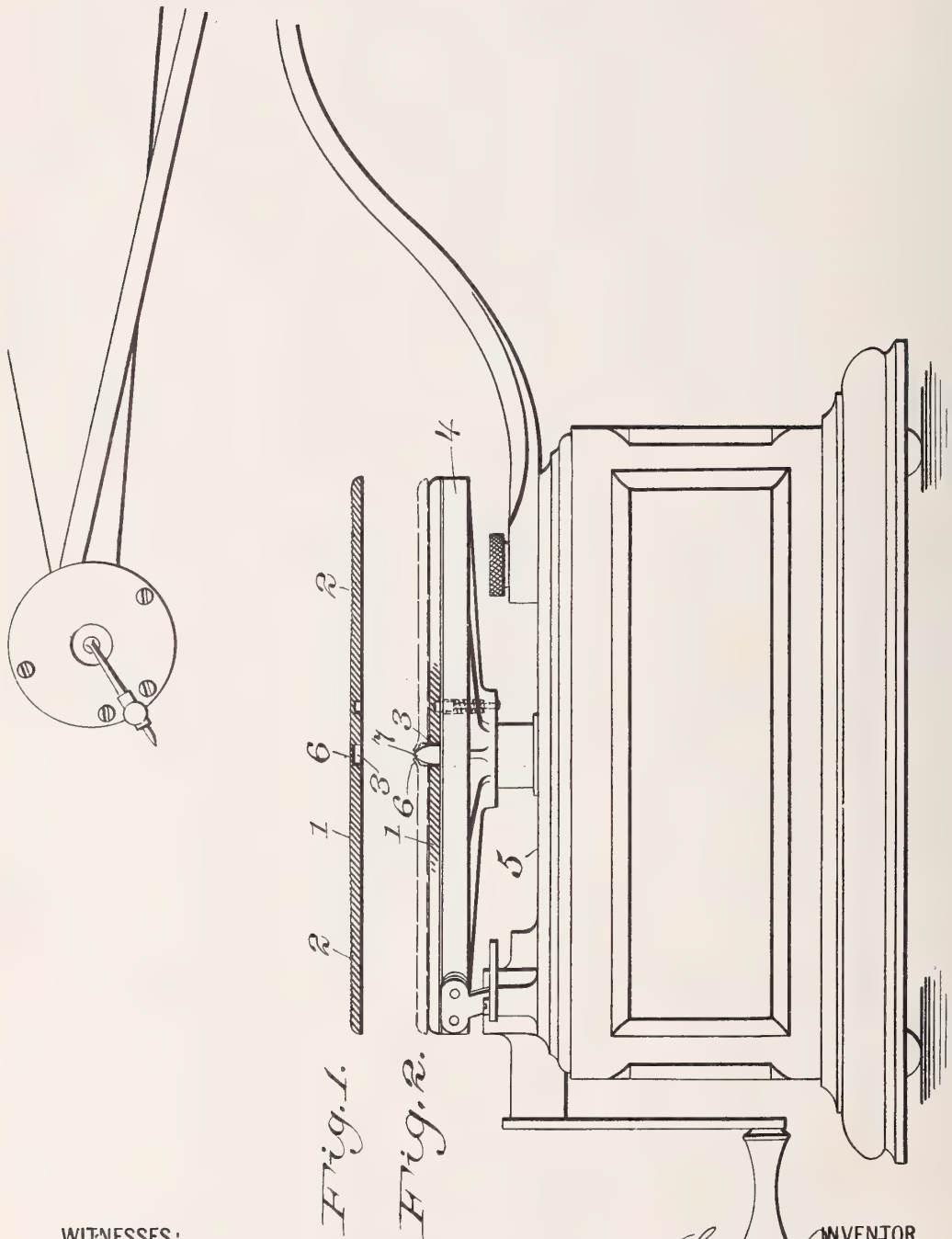
No. 701,820.

Patented June 3, 1902.

L. P. VALIQUET.
SEAL FOR TALKING MACHINE RECORDS.

(Application filed Mar. 27, 1902.)

(No Model.)



WITNESSES:

R. E. Pearson
H. H. Humphrey.

INVENTOR
Louis P. Valiquet
BY *A. H. Schmitt*
ATTORNEY

UNITED STATES PATENT OFFICE.

LOUIS P. VALIQUET, OF NEW YORK, N. Y.

SEAL FOR TALKING-MACHINE RECORDS.

SPECIFICATION forming part of Letters Patent No. 701,820, dated June 3, 1902.

Application filed March 27, 1902. Serial No. 100,207. (No model.)

To all whom it may concern:

Be it known that I, LOUIS P. VALIQUET, a citizen of the United States of America, and a resident of the city of New York, county of New York, State of New York, have invented certain new and useful Improvements in Seals for Talking-Machine Records, of which the following is a specification.

My invention relates to sound-reproducing apparatus in general, and more specifically consists of an improved sound-record tablet and reproducing apparatus combined therewith whereby the first use of a record-tablet for reproducing purposes will leave indestructible and unremovable evidence of the fact that said record-tablet has been so used and will thereby render it impossible for unprincipled dealers to sell second-hand sound-records on the representation that they have never been used.

Heretofore it has been proposed to provide evidence of the fact that any particular record-tablet is fresh from the maker and has not been used by attaching to the tablet a seal, such as a piece of paper or a thread, which must be broken when the tablet is placed on the reproducing-machine.

The distinctive feature of my invention consists in making the part which serves as evidence of newness an integral part of the record-tablet, the same being a thin film of the material of which the tablet is made. This extends across an opening through which some member of the reproducing apparatus projects, and such film is consequently fractured upon the first use of the record for reproduction. This film of the record material cannot be replaced and the seal so produced cannot be counterfeited.

I have illustrated a form of record-tablet and reproducing-machine therefor embodying the preferred form of my invention in the accompanying sheet of drawings, in which—

Figure 1 is a section of a sound-record tablet constructed in accordance with my invention; and Fig. 2 is a side elevation of a reproducing apparatus, showing such sound-record tablet in operative relation therewith, the tablet being partly in section in the full-line position.

Throughout the drawings like reference-figures indicate like parts.

The sound-record tablet 1, which is prefer-

ably of the flat disk-shaped form, has the sound-record grooves 2 sunk in one face and the central recess 3 for centering the tablet upon the revolving table 4 of the reproducing or talking machine 5 shown in Fig. 2. Instead of having such recess 3 extend through the tablet 1, so as to form a perforation therein, as is usually the case, I leave a thin film or web 6 of the material of which the tablet is formed extending across the recess 3, as shown in Fig. 1. Preferably this web is in line with the upper surface of the record-tablet and is formed in the same operation by which the tablet is stamped out originally between proper dies. The reproducing apparatus preferably has a pointed pin 7 projecting upward from the center of table 4, which engages the recess 3 and pierces and fractures the film or web 6 when the record-tablet is forced down to a bearing on the rotatable table 4, as must be done before a reproduction of the record can take place.

The method of operating my invention is as follows: The record-tablet is stamped out in the form shown in Fig. 1. When put upon the reproducing-machine, the pin 7 perforates the film or web 6 as the record-tablet is being forced down to a bearing on the rotatable table, as shown in dotted lines in Fig. 2. By the time the tablet has reached a bearing on the table the fragments of the film are usually broken completely off, leaving the usual central perforation through the tablet, as shown in full lines in the cross-sectional portion of Fig. 2. If small portions of the film adhere to the edges of the opening, however, they do not interfere with the operation and will be completely broken off in successive reproductions. It is evident, of course, that the film 6 being so fractured before any reproduction is possible cannot be so replaced as to avoid detection, and the seal is therefore impossible to counterfeit when my invention is used in its entirety. The advantages of my invention comprise this impossibility of counterfeiting, the improbability of the removal of the seal from natural causes other than the normal use of the record, and the cheapness of its application to the record-tablet.

It is evident, of course, that my invention might be applied to other forms of sound-record tablet than the one shown, that the form

of the reproducing-machine might be correspondingly altered, and that the location of the film or web 6 might be varied so long as there was a member of the reproducing-machine adapted to perforate the web on the first reproduction of the record.

Having, therefore, described my invention, what I claim as new, and desire to protect by Letters Patent, is—

- 10 1. A sound-record tablet having a central recess for centering the record on the reproducing apparatus, with a thin film of the material of which the tablet is formed extending across said recess.
- 15 2. A sound-record tablet having a central recess in its under surface for centering the record on the reproducing apparatus, with a thin film of the material of which the tablet is formed extending across said recess in line
- 20 with the upper surface of the tablet.
3. A sound-record tablet having a central

recess for centering the record on the reproducing apparatus, with a thin film of the material of which the tablet is formed extending across said recess, combined with a reproducing-machine having a rotating table and an upwardly-projecting pointed center pin adapted to enter said recess and pierce said film.

4. A sound-record tablet having a recess formed in it across which recess extends a thin film of the material of which the tablet is formed, combined with a reproducing-machine having a rigid projecting member adapted to enter said recess and pierce said film prior to the operation of reproduction.

Signed at New York city, New York, this 26th day of March, 1902.

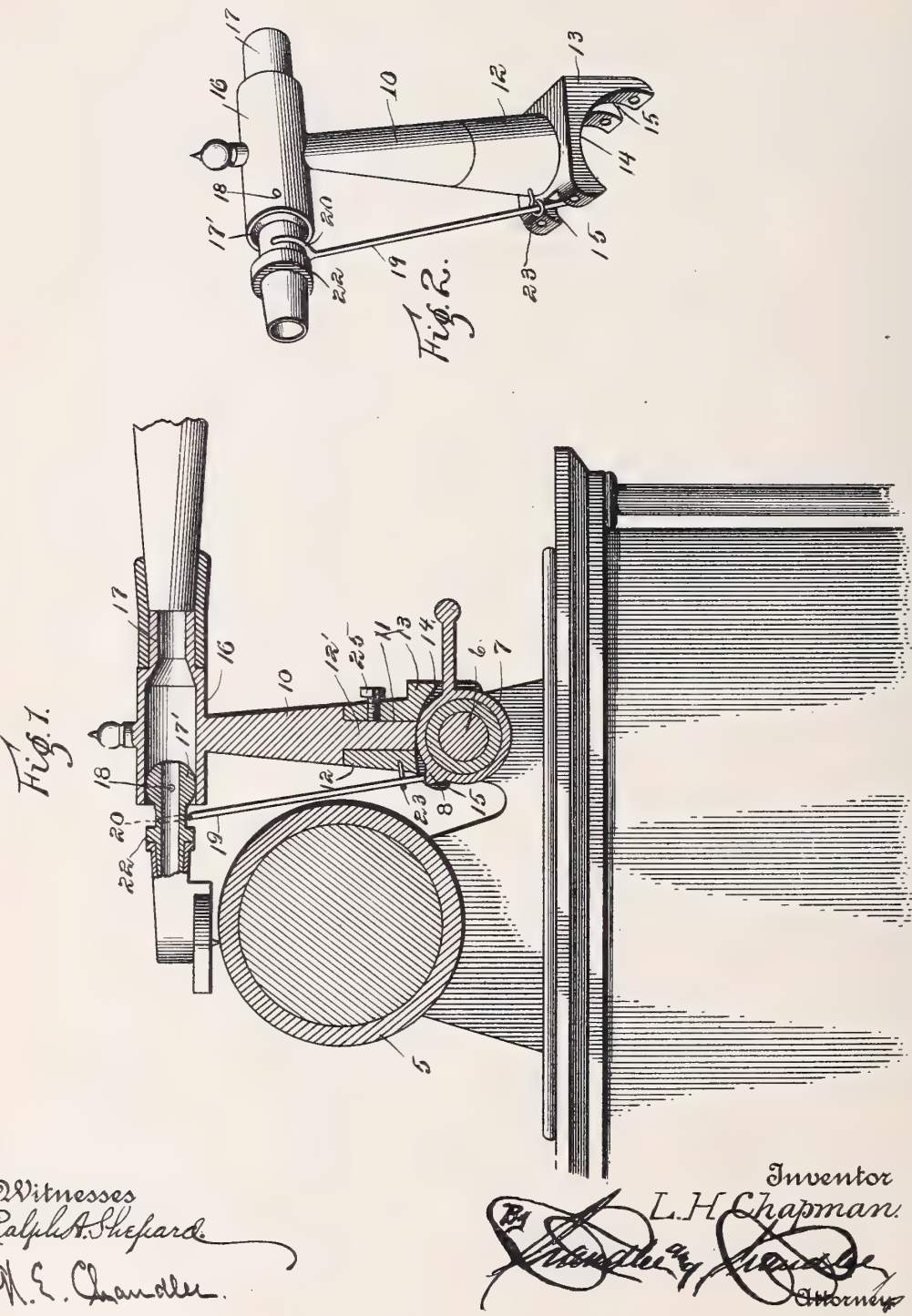
LOUIS P. VALIQUET.

Witnesses:

W. H. PUMPHREY,
L. E. PEARSON.

L. H. CHAPMAN.
GRAPHOPHONE ATTACHMENT.
(Application filed Feb. 20, 1901.)

(No Model.)



Witnesses
Ralph B. Shepard
W. E. Chandler.

Inventor
L. H. Chapman.
[Signature]
Attorney

UNITED STATES PATENT OFFICE.

LOUIS H. CHAPMAN, OF LITTLEFALLS, NEW YORK.

GRAPHOPHONE ATTACHMENT.

SPECIFICATION forming part of Letters Patent No. 703,764, dated July 1, 1902.

Application filed February 20, 1901. Serial No. 48,128. (No model.)

To all whom it may concern:

Be it known that I, LOUIS H. CHAPMAN, a citizen of the United States, residing at Littlefalls, in the county of Herkimer, State of New York, have invented certain new and useful Improvements in Graphophone Attachments; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to graphophones wherein the sound-box is held in position with the sound-tube practically horizontal; and it has for its object to provide means for raising and lowering the sound-box from the usual finger-piece.

In the drawings forming a portion of this specification, and in which like numerals of reference indicate similar parts in the two views, Figure 1 is a view partly in section and partly in elevation and showing the bracket in its operative position on a graphophone. Fig. 2 is a perspective view of the bracket detached.

Referring now to the drawings, the record of the graphophone is shown at 5 and the feed-screw at 6, this screw having the usual feed-nut, upon which is loosely mounted a collar 7, at one side of which projects a finger-piece and at the other a lug 8. The collar is adapted for limited rotary movement under the influence of the finger-piece to raise and lower the lug.

The bracket, which is mounted upon the feed-nut, consists of a stem portion 10, the lower end of which is reduced, as shown at 11, and is engaged slidably with a socket 12' in a base 12, which latter has an enlarged lower end 13, in which is formed a semicircular recess 14, adapted to fit over one side of the feed-nut, to which latter it is held by means of screws. In the face of this semicircular recess is formed a groove 15, which passes through both the front and the rear of the enlarged lower end of the base, the slot through the front portion—that is, the portion adjacent the record—receiving the lug of the collar 7, while the slot through the rear receives the finger-piece. The upper portion of the collar moves in that portion of the slot lying between the front and rear of the lower

end of the base, so that by manipulating the finger-piece the collar may be easily operated freely of the bracket.

Upon the upper end of the bracket is fixed a tubular head 16, or it may be formed integral therewith, this head lying at right angles to the stem and having one end reduced, as shown at 17, to receive the sound-funnel. In the opposite end of the head 16 there is disposed the end of a tube-section 17', which is formed as a ball, so that a tight joint will be made irrespective of the angle at which the tube-section may lie to the head, it being understood that this ball forms a universal connection between the tube-section and the head. It is only necessary, however, that the tube-section have a pivotal movement in a plane at right angles to the axis of the record to permit the sound-box to move toward and away from the record, and as a means for holding the tube-section in the head pins 18 are passed through the sides of the head and pivotally engaged with the ball in the line of its transverse diameter.

In order that the tube-section 17' may be raised and lowered through the medium of the finger-piece upon the collar 7, a rod 19 is provided. This rod 19 has a yoke 20 at its upper end, in which rests the tube-section 17' at a point exterior to the head 16 and between it and an annular flange 22 on the tube-section, and the lower end of the rod 19 is passed through a guide-eye 23 upon the base 12 and in which it is adapted to reciprocate, this eye acting to hold the lower end of the rod in the path of upward movement of the lug 8 of the collar 7. Thus it will be seen that as the finger-piece is depressed the rod will be moved upwardly and will raise the tube-section. The end of the tube-section 17' is formed for the reception of the sound-box in the usual way, and hence as the tube-section moves upwardly the sound-box is raised. It will be seen upon reference to the drawings that the bracket is of such height as to support the sound-box, with its stylus, in contact with the uppermost portion of the record, and in order to adjust the height of the box to the proper degree a set-screw 25 is engaged with the base 12 and passes into the socket 12', so that it may engage the lower reduced end 11 of the stem 10 and hold

the stem at different points of its sliding movement in the base.

It will be seen that the box may be properly adjusted to the record, it may be raised and lowered readily, and the sound will pass out directly from the box. This construction is found to prevent the metallic sounds usually heard in graphophones, and the sounds are clear and pure in tone.

In the manufacture of the bracket it may be made of wood or of metal or of any other material that is suitable, and I may modify its construction.

Having thus described my invention, what I claim is—

1. A sound-box bracket comprising a base adapted for connection to the feed-nut of a graphophone and having a slot to receive the collar thereof, a tubular head having a stem connected to the base adapted for attachment of a sound-funnel at one end, a tube-section pivotally connected with the opposite end of the head, an eye carried by the base and a rod exterior to the stem and base, and passed through the eye, said rod having a yoke at its upper end in which the pivoted

tube-section rests and having its lower end disposed in the slot of the base for engagement by the lug or lifting-finger of the collar.

2. A sound-box bracket comprising a base adapted for connection to the feed-nut of a graphophone and having a slot to receive the collar thereof, a tubular head having a stem connected to the base and adapted for attachment of a sound-funnel at one end, a tube-section pivotally connected with the opposite end of the head, an eye carried by the base and a rod exterior to the stem and base, and passed through the eye, said rod having a yoke at its upper end in which the pivoted tube-section rests and having its lower end disposed in the slot of the base for engagement by the lug or lifting-finger of the collar, the head and base being adjustable toward and away from each other.

In testimony whereof I affix my name in the presence of two witnesses.

LOUIS H. CHAPMAN.

Witnesses:

P. H. McEVoy,
ADAM H. LEVER.

703774

No. 703,774.

Patented July 1, 1902.

T. A. EDISON.
REPRODUCER FOR PHONOGRAPHS.

(Application filed Mar. 24, 1898.)

(No Model.)

3 Sheets—Sheet 1.

Fig. 1

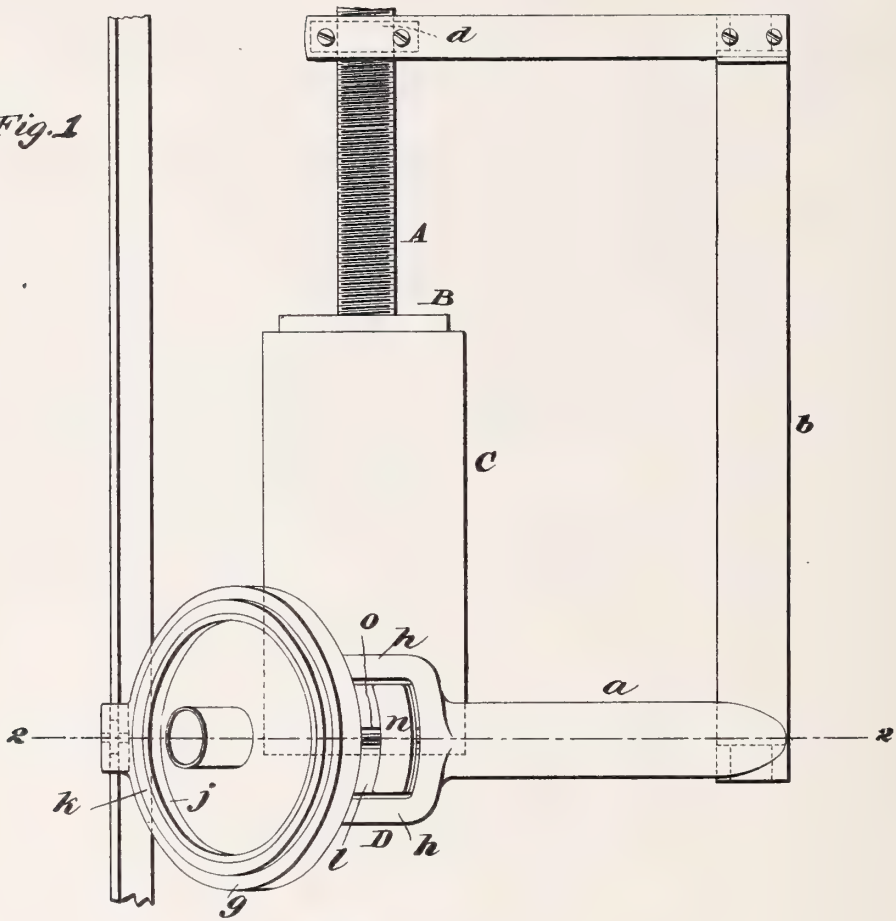
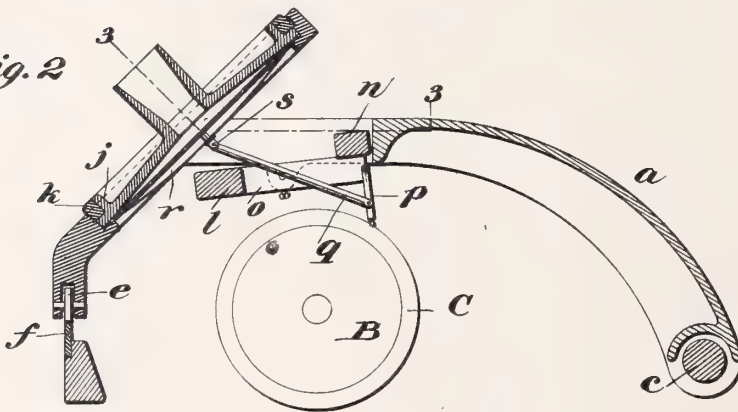


Fig. 2

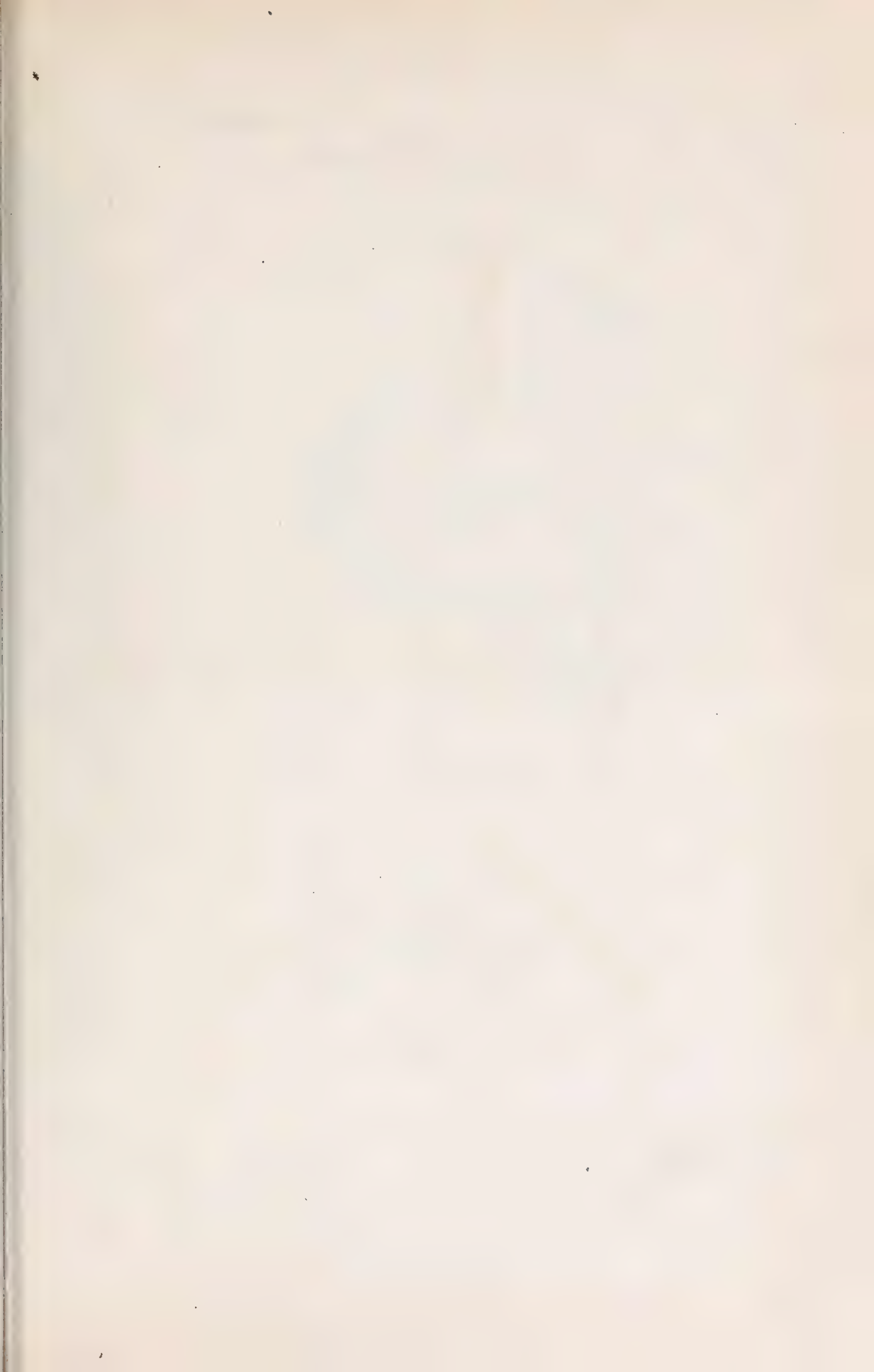


Witnesses:

Jas. C. Coleman
Grand L. Soper

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Thomas A. Edison,
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No. 703,774.

Patented July 1, 1902.

T. A. EDISON.
REPRODUCER FOR PHONOGRAPHS.

(Application filed Mar. 24, 1898.)

(No Model.)

3 Sheets—Sheet 2.

Fig. 3

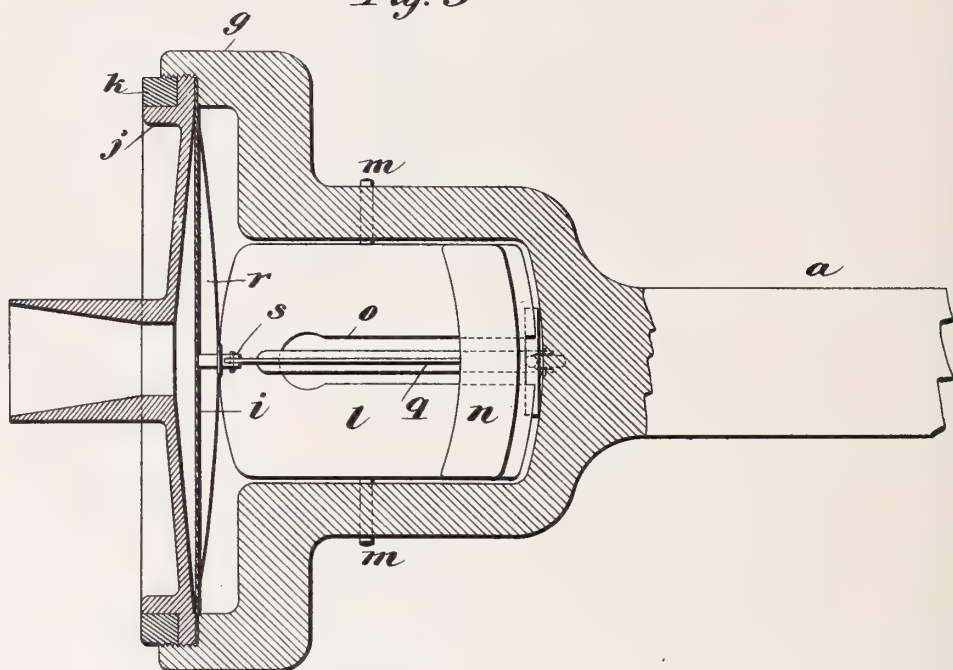
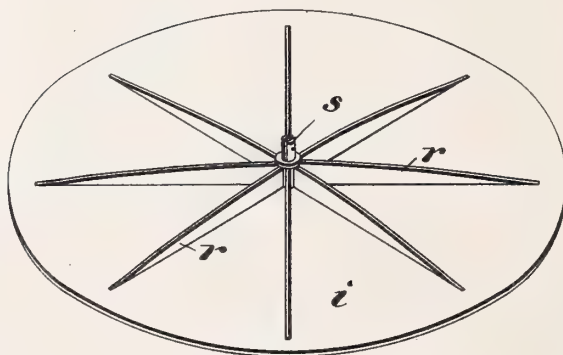


Fig. 4



Witnesses:

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Frank L. Sizer

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No. 703,774.

Patented July 1, 1902.

T. A. EDISON.
REPRODUCER FOR PHONOGRAPHS.

(Application filed Mar. 24, 1898.)

(No Model.)

3 Sheets—Sheet 3.

Fig. 5

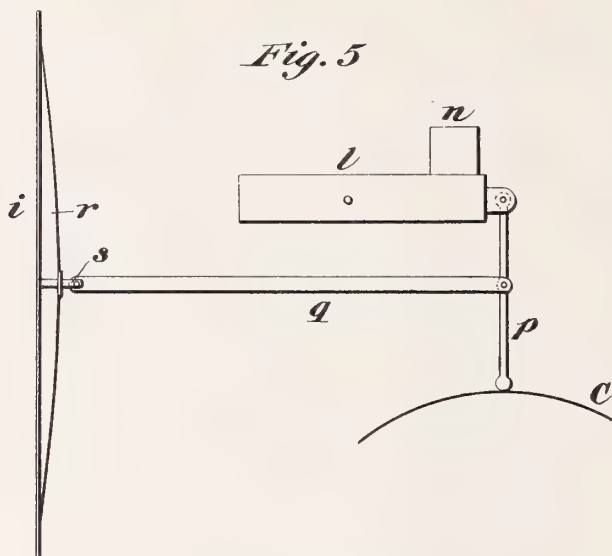
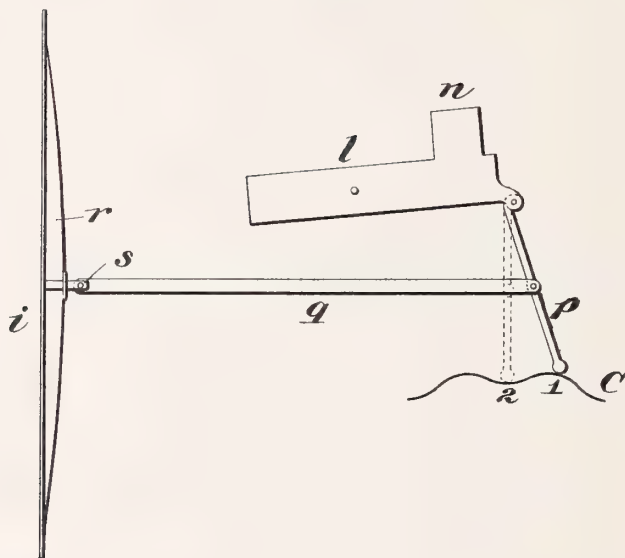


Fig. 6



Witnesses:

Jas. C. Coleman
Frank L. Spier

Inventor

Thomas A. Edison
By Rich. M. Ayer
Att'y.

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

REPRODUCER FOR PHONOGRAPHS.

SPECIFICATION forming part of Letters Patent No. 703,774, dated July 1, 1902.

Application filed March 24, 1898. Serial No. 675,000. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, a citizen of the United States, residing at Llewellyn Park, in the county of Essex and State of New Jersey, have invented a certain new and useful Improvement in Reproducers for Phonographs, of which the following is a specification.

My invention relates to improvements in reproducers for phonographs and other talking-machines.

The object I have in view is to provide a sound-reproducer for the purpose by which the record on the blank will be closely and accurately followed by the reproducer-point, so as to result in the better reproduction of the original sounds, and wherein false vibrations will be eliminated to a large extent.

In carrying out my invention I so support and arrange the reproducing arm or lever relatively to the blank that the friction between the reproducer ball or point and the blank may be utilized in effecting vibration of the diaphragm. The friction with the record, therefore, instead of being a source of objection is by my invention effectively utilized in the reproduction. This friction may alone be relied upon to effect vibration; but I prefer to construct the device in such a way that the vibration of the reproducer ball or point will be directly communicated to and assist in the vibration of the diaphragm.

A further important feature of my invention relates to the construction and mounting of the diaphragm, whereby slight false vibrations are largely eliminated and the true vibrations largely amplified.

In the production of what I consider to be the best form of my invention I provide a reproducer arm or lever arranged at an angle to the diameter of the blank, so that it will trail easily and smoothly upon its surface, said reproducing-lever being pivoted at its upper end to a slightly-overbalanced weight, by which the reproducer-point will be kept always in contact with the blank, but will be free to accommodate itself to irregularities and eccentricities therein, said weight possessing sufficient inertia to be uninfluenced by the vibrations of the reproducing-point, and I connect said reproducing arm or lever with the diaphragm by a single link, which

may work within a slot in the weight, said diaphragm being provided, preferably on its under side, with a series of radial stiffening-ribs gradually decreasing in thickness from their point of intersection at the center of the diaphragm, and the plate or disk to which the diaphragm is secured being arranged very closely to the diaphragm, so that the said disk and diaphragm will constitute a dash-pot, whereby a retarded movement of the diaphragm will be obtained. The advantages of these special constructions and their cooperation in the carrying out of my object to obtain a more perfect reproducer will be hereinafter explained.

In order that my invention may be understood, attention is directed to the accompanying drawings, forming part of this specification, and in which—

Figure 1 is a plan view of parts of a well-known form of phonograph, showing the preferred form of my present invention applied thereto. Fig. 2 is a section through the same on the line 2 2; Fig. 3, a section on the line 3 3 of Fig. 2; Fig. 4, a perspective view of the preferred form of diaphragm; Fig. 5, a diagrammatic view illustrating a modification of my invention wherein friction alone is relied upon to effect the vibrations of the diaphragm, and Fig. 6 a diagrammatic view illustrating the operation of the preferable form of my invention.

In all of the above views corresponding parts are represented by the same characters of reference.

A represents the feed-shaft of an ordinary phonograph, and B the blank mandrel thereof.

C represents the phonogram-blank carried on said mandrel.

D represents the main operative parts of the improved reproducer, carried on an arm *a*, connected to a sleeve *b*, the latter working on a stationary rod *c* at the back of the instrument. The reproducer is fed longitudinally of the blank B by a nut *d*, cooperating with the feed-screw A. The arm *a* is supported at its forward end by an antifriction-roller *e*, working on a track *f*. The reproducer in this instance comprises a flanged annular ring *g*, carried by the bifurcated arms *h h* of the arm *a*. The diaphragm *i* is sup-

ported on the flange of the ring *g*, and above said diaphragm is the plate *j*, held in place by a clamping-ring *k*. The plate *j* is provided with a hollow nipple, to which the listening tubes or horn are or is attached. Mounted upon the arms *h h* is a weight *l*, carried on horizontal pivots *m* and overbalanced at its rear end either by placing the pivots *m* forward of the center of gravity or by employing an auxiliary weight *n*, cast integral therewith, as shown. The weight *l* is formed with a slot *o* therein. The reproducer arm or lever *p* is pivoted at its upper end to the weight *l*, and its lower end is formed in a small ball, jewel, or other suitable surface for co-operation with the record. The reproducer arm or lever *p* will be maintained in contact with the record by reason of its connection with the weight *l*, which possesses sufficient inertia to be uninfluenced by the vibrations of the record, but which at the same time will be affected by any inequalities or eccentricities of the blank. The reproducer arm or lever *p* is shown as extending at an angle to the diameter of the blank *B*, so that it will trail smoothly and easily thereon without chattering. The said reproducer arm or lever is connected to the diaphragm *i* at its central part by a link *q*, passing through the slot *o* in the weight. By employing a weighted retarding device, as explained, in connection with a reproducer arm or lever, arranged at an angle with respect to the diameter of the blank, the effect of the weight is to move or slide the reproducer-point relatively to the blank, tending to increase the angle of inclination and producing a normal strain or tension upon the diaphragm, so that any vibrations of the point will be communicated to the diaphragm without lost motion and the elasticity of the diaphragm will maintain the reproducing-point always in contact with the record. When it is desired to give to the diaphragm *i* a retarded movement to reduce false vibrations, as will be explained, the plate or disk *j* is arranged in such proximity to the diaphragm that the film of air between the two will in being rapidly compressed and expanded under the vibrations of the diaphragm effect the necessary retardation thereof. In order, however, to increase this effect and at the same time to produce increased effect of the true vibrations, the diaphragm is preferably stiffened, so that it will move bodily under the effect of the vibrations, and in Fig. 4 I illustrate the preferred way of effecting this result. In this figure the diaphragm *i* is shown as being provided on its under side with a series of radial ribs *r*, converging at the center and impinging against a pivot *s*, to which the link *q* is secured. These radial ribs *r* are secured to the diaphragm in any suitable way, and they are preferably of a gradually-decreasing thickness from the center toward the periphery. The said ribs may be made of wood, metal, or other material.

In operation the overbalanced weight *l* will,

as stated, cause the reproducer-point to be always maintained in engagement with the record, irrespective of imperfections and eccentricities therein. The blank *B* in revolving beneath the point will cause an additional outward stress on the diaphragm other than that produced by the effect of the weight, an action which, so far as I am aware, has never before been secured in this art. When an undulation occurs on the blank, the friction on the reproducer point or ball is nearly obliterated, because the inertia of the weight is such that it cannot cause the depression of the lever *p* and reproducer-point with sufficient rapidity to follow the record. Hence this is effected by the elasticity of the diaphragm, which, as stated, is under the tension of the weight and of the friction with the blank. This reproducer point or ball having been forced by the elasticity of the diaphragm to the bottom of the indentation, the riding up against the incline of the indentation by the reproducer point or ball produces a great increase of friction, (in excess of the normal friction which would result from the engagement of the reproducer with a smooth blank,) and this causes the diaphragm to be again placed under tension. When the lever *p* is not oblique, as in Fig. 5, the only motion which the diaphragm can receive must be due entirely to the action of friction between the reproducer and the record, since no vertical motion of the reproducer will give any appreciable movement to the diaphragm. I consider it preferable, however, to supplement the friction due to the rise and fall of the producer on the blank by the variations in the blank being communicated directly to the diaphragm, as is possible with an inclined reproducer, as described. This action is clearly illustrated in Fig. 6. The lever *p* being pivoted to the weight swings on practically a fixed pivot due to the inertia of the weight. From the top 1 of the undulation to the bottom 2 thereof the lever is moved by the elasticity of the diaphragm, while in being moved back to its original position the friction is sufficient to again place the diaphragm under tension, the effect of the weight on the inclined lever *p* producing a much greater stress on the diaphragm than would be produced by friction alone, as in Fig. 5. With the form shown in Fig. 6, therefore, the vibrations of the diaphragm will be very powerful, and at the same time the original sound-waves will be faithfully and accurately reproduced.

The improved diaphragm is made, preferably, of very thin mica, and the radial ribs extend very close to the edge. The radial arms are proportioned in number to the thickness of the diaphragm, so that the areas between said arms may not vibrate independently. When properly proportioned, almost all of the elasticity will be obtained in the edge portion of the diaphragm, and the motions produced by the record cause nearly the whole surface

of the diaphragm to move with the same amplitude and not at the central portion only, as is now the case. Such a diaphragm will therefore result in very powerful reproduction.

In order to reduce false vibrations, the amplitude of which is very slight, I arrange the diaphragm, as stated, adjacent to the plate or disk *j*, so that a retarded movement of the diaphragm will be secured by causing the diaphragm itself to act as the piston element of the dash-pot, the other element of the dash-pot being the said disk or plate. It will thus be seen that the thin film of air which exists between these two elements will be rapidly compressed under the vibrations of the diaphragm, acting to retard the same and eliminating the small false vibrations, though not affecting the true vibrations. This retardation of the diaphragm is enhanced if the diaphragm moves bodily, as stated, rather than simply buckling at its central part, as is now the case.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is as follows:

1. In a phonograph, the combination with a phonograph-record, of a reproducing-lever carrying a reproducing device coöperating with said record, a weighted retarding device connected with said lever at its end, a diaphragm, and a link connecting said diaphragm with said lever between the reproducing device and said weight, whereby the friction between the reproducing device and the rotating record will impose stress on the diaphragm, substantially as and for the purposes set forth.

2. In a phonograph, the combination with a phonograph-record, of a reproducing-lever carrying a reproducing device which coöperates with the record, said lever being arranged at an angle to the diameter of the record, a weighted retarding device connected to said lever at its end, a diaphragm, and a link connecting said diaphragm with the reproducing-lever between the reproducing device and said weight, whereby the effect of the weight tends to increase the inclination of said lever to impose tension on the diaphragm, substantially as and for the purposes set forth.

3. In a phonograph, the combination with a phonograph-record, of a reproducing-lever carrying a reproducing device coöperating with said record, a pivoted retarding-weight

to which the lever is pivoted at its end, a diaphragm, and a link connecting the diaphragm with said lever between the reproducing device and said weight, substantially as and for the purposes set forth.

4. In a phonograph, the combination with a phonograph-record, of a reproducing-lever carrying a reproducing device coöperating with said record, a pivoted retarding-weight to which the lever is pivoted at its end, a diaphragm, and a link connecting the diaphragm with said lever between the reproducing device and said weight, said link passing through a slot in the weight, substantially as and for the purposes set forth.

5. In a phonograph, the combination with the record, of a reproducing-point, a diaphragm connected to the reproducing-point, a stationary casing with respect to which said diaphragm vibrates, the diaphragm being located sufficiently close to the casing as to allow for a thin film of air between the two, whereby the vibrations of the diaphragm will be retarded, and radial ribs secured to said diaphragm for stiffening said diaphragm so as to produce bodily movements thereof, substantially as set forth.

6. In a phonograph, the combination with the record, of a reproducing-point, a diaphragm connected to the reproducing-point, a stationary casing with respect to which said diaphragm vibrates, the diaphragm being located sufficiently close to the casing as to allow for a thin film of air between the two, whereby the vibrations of the diaphragm will be retarded, and radial ribs of gradually-decreasing thickness secured to said diaphragm for stiffening said diaphragm so as to produce bodily movements thereof, substantially as set forth.

7. An improved diaphragm for phonographs comprising a plate, and radial ribs secured to the same on one side thereof, substantially as set forth.

8. An improved diaphragm comprising a plate, and radial ribs of gradually-decreasing thickness secured to the same on one side thereof, substantially as set forth.

This specification signed and witnessed this 21st day of March, 1898.

THOMAS A. EDISON.

Witnesses:

S. O. EDMONDS,
J. F. RANDOLPH.

704007

No. 704,047.

Patented July 8, 1902.

E. R. JOHNSON.
SOUND RECORDING AND REPRODUCING DEVICE.

(Application filed Nov. 2, 1900.)

(No Model.)

Fig. 1.

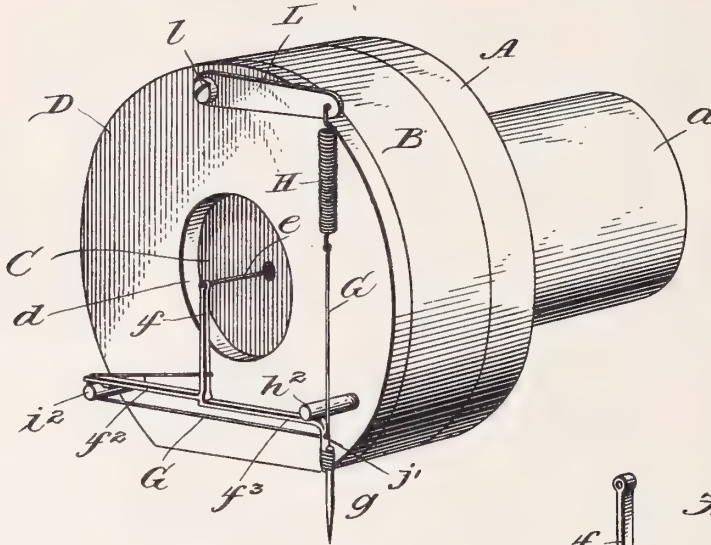


Fig. 2.

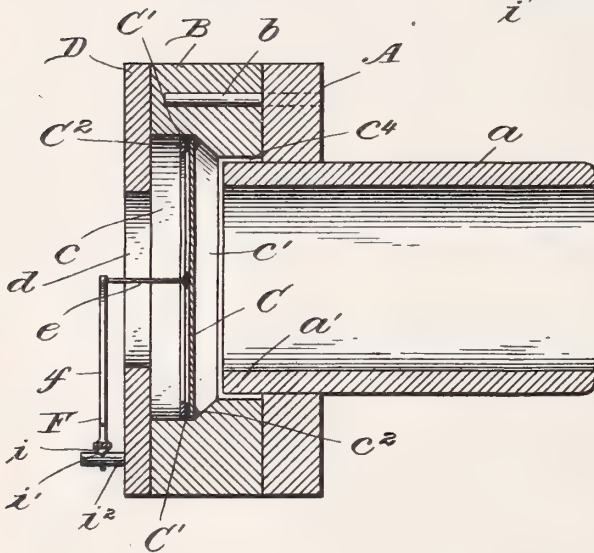


Fig. 3.

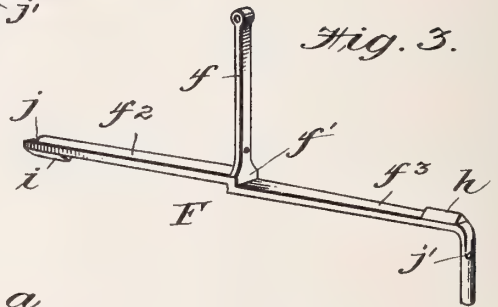
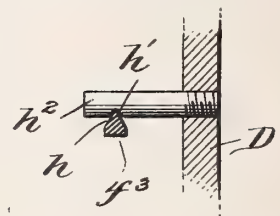


Fig. 4.



Witnesses.

Geo. F. Cross
Chas. H. Bennett

Inventor,
Eldridge R. Johnson
by *John P. Reid*
his Attorney.

UNITED STATES PATENT OFFICE.

ELDRIDGE R. JOHNSON, OF PHILADELPHIA, PENNSYLVANIA.

SOUND RECORDING AND REPRODUCING DEVICE.

SPECIFICATION forming part of Letters Patent No. 704,047, dated July 8, 1902.

Application filed November 2, 1900. Serial No. 35,193. (No model.)

To all whom it may concern:

Be it known that I, ELDRIDGE R. JOHNSON, a citizen of the United States, and a resident of the city of Philadelphia, State of Pennsylvania, have invented certain new and useful Improvements in Sound Recording and Reproducing Machines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

My invention relates to certain improvements in sound recording and reproducing apparatus, and particularly to that part known as the "sound-box."

In recording sound-waves I have found from experience that the stylus-point must be adjusted to a nicety, even down to a thousandth of an inch, in order to obtain the very best results, and I also find that under different conditions of temperature this adjustment varies by reason of the contraction and expansion of the various parts of the device. Consequently I have found it necessary to provide for very finely adjusting the stylus-point and its supporting-bar and to provide a tensioning device therefor.

The principal object of this invention is to provide a sound-box particularly adapted for recording purposes so constructed as to readily yield to the impulses of the sound-waves in any and all directions; also, in providing means for finely adjusting the stylus-point, so that the depth of the cut may be regulated to a nicety; also, in providing a tensioning device which will maintain the proper adjustment of the stylus-bar under different conditions of temperature in the event of contraction or expansion.

With these and other objects in view my invention consists in the construction and arrangement of the mechanism, substantially as hereinafter set forth, and particularly pointed out in the claims.

Referring to the accompanying drawings, Figure 1 is a perspective view of a recording sound-box embodying my invention. Fig. 2 is a central sectional elevation through the same. Fig. 3 is a detail perspective view of the stylus-bar. Fig. 4 is a detail section illustrating one of the studs for supporting the stylus-bar and also illustrating the knife-edge bearing.

In the said drawings I provide a circular supporting-disk A, which has formed thereon or secured thereto the usual tubular section *a*, adapted to be connected either directly or indirectly to a mouthpiece or other sound-conveying device. The inner end of the tubular section *a* projects a short distance beyond the front face of the disk A, as illustrated in Fig. 2 of the drawings. Projecting from the front face of the section A is a pin or rod *b*, the said rod being riveted or otherwise secured in the section A.

B designates the diaphragm-holding section and consists of a circular disk of a diameter corresponding to that of the disk A, having its central portion cut out in the manner illustrated in Fig. 2 of the drawings for the reception of the diaphragm C. The front portion *c* of the diaphragm-chamber is larger in diameter than the rear portion *c'*, and between these two portions is formed an inclined wall *c''*. The projecting end *a'* of the tubular section *a* fits into the opening *c''*, formed in the rear of the section B, the said opening being of slightly larger diameter than that of the tubular section, so as to allow of a slight play between these two parts. The section B is pivotally mounted on the rod *b*, carried by the disk A, so that the said section B may swing very slightly, if desired. On the front face of the section B, I provide a circular plate D. The diaphragm C is supported by means of a liquid film *C'*, which adheres to the inner walls of the section B and also to an adjustable ring *C''*, the object of the said ring *C''* being to provide an enlarged surface adjacent to the diaphragm for the liquid film to adhere to, so that an increased body of liquid may be maintained and supported by capillary attraction, this particular construction of diaphragm being specifically described in my application for patent filed January 20, 1900, and bearing the Serial No. 2,178.

Secured to the center of the diaphragm C by means of the usual wax or cement is a very thin rod *e*, which extends out beyond the front plate D through the opening *d* provided therein and has secured to its free end the arm *f* of the stylus-bar F. This stylus-bar F is substantially T-shaped in form, having a step or shoulder *f'* in its center at the point

where the arm f is secured to the horizontally-disposed arms f^2 and f^3 . The arm f^3 is bent downwardly at its end to form a shank, to which is secured the stylus-point g . On the upper surface of arm f^3 I provide the knife-edge bearing h , which is adapted to bear against a V-shaped notch h' , formed on the under side of the stud h^2 , which is secured in the plate D of the sound-box frame.

On the under surface of the arm f^2 of the stylus-bar F, I provide a knife-edge bearing i , located at or near the end of said bar, which is adapted to a V-shaped notch i' , provided in the upper surface of the stud i^2 , which stud is also secured to the plate D of the sound-box frame. A small groove or notch j is provided on the end of the arm f^2 , and a small opening j' is formed on the downwardly-extending portion of the arm f^3 a short distance below the knife-edge bearing h . Secured to the arm f a short distance above its connection with the horizontal arms f^2 f^3 is a cord G, preferably composed of silk, the said cord passing over the end of the arm f^2 , resting in the groove j , passing around the under side of the stud i^2 , and through the opening j' , formed in the downwardly-extending section of the arm f^3 . From thence it passes upwardly, bearing slightly against the stud h^2 , and is connected at a point above the center of the diaphragm to a finely-tensioned coil-spring H. Secured to the upper face of the plate D of the sound-box frame is a substantially horizontally disposed arm L, the said arm being adjustably mounted to the sound-box frame by means of the pivot-screw l . To the free end of the arm L is secured the upper end of the coiled spring H, to the lower end of which is secured one end of the cord G, as heretofore described. It will thus be seen that the stylus-bar F is yieldingly supported by means of the silk cord G under the tension of the spring H and that this spring will serve to keep the knife-edge bearings always in contact with the notches provided in the studs h^2 i^2 , and thus take up any looseness or defect which might be caused by reason of the expansion and contraction of the various parts. It will also be readily seen and understood that the tension may be increased or diminished by adjusting the set-screw l and regulating the height of the arm L. By reason of the sound-box section B being pivotally mounted on the rod b also allows this section to slightly expand or contract, as the opening c' is slightly larger than the projecting end a' of the tubular section a .

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a sound-recording apparatus, the combination with the sound-box frame having a diaphragm located therein, of a horizontally-disposed stylus-bar having an arm perpendicularly disposed and connected with the diaphragm, knife-edge bearings on the under side of the horizontally-disposed bar at one

end and on the upper side at the opposite end, and means for maintaining the said stylus-bar in contact with its bearings, for the purpose described.

2. In a sound-recording apparatus, the combination with the sound-box frame, of a diaphragm located therein, a horizontally-disposed stylus-bar having a central arm connecting with the diaphragm, supports carried by the sound-box frame extending under one end of the stylus-bar and above the opposite end, knife-edges carried by the under and upper ends of the stylus-bar respectively adapted to bear against the supports, and means for keeping the stylus-bar in contact with its bearings, substantially as described.

3. In a sound-recording apparatus, the combination with the sound-box frame, a diaphragm located therein, a horizontally-disposed arm connecting the stylus-bar with the diaphragm, knife-edge bearings located at each end of the stylus-bar on its upper and lower sides respectively, studs carried by the sound-box frame against which the knife-edges bear, and a cord secured to the central arm of the stylus-bar bearing against one end of the horizontal bar and passing under its supporting-stud and through an opening provided in the opposite end of the same, the end of said cord being yieldingly secured to the sound-box frame, substantially as described.

4. In a sound recording and reproducing apparatus, the combination with the sound-box frame, of a diaphragm, a horizontally-disposed stylus-bar, a central arm for said bar having a connection with the diaphragm, studs arranged below one end and above the other end of the stylus-bar, knife-edges adapted to bear against the said studs, a cord secured to the stylus-bar and passing under each of its bearings, a spring secured to the other end of said cord and means for adjusting the tension of said spring, substantially as described.

5. The combination with the sound-box frame, of a diaphragm located therein, a T-shaped stylus-bar having its vertical arm secured to the diaphragm, a pair of studs secured to the sound-box frame, extending under the stylus-bar at one end and above the same at the other end, V-shaped notches formed in said studs, knife-edges carried by the lower side of the bar at one end and the upper side at the opposite end, a cord secured to the stylus-bar and passing under each of its bearings for keeping the said bearings in contact with the studs, a yielding spring connecting the end of the cord, and an adjustable arm secured to the sound-box to which the free end of the spring is connected, substantially as described.

6. The combination with the sound-box casing, of a diaphragm located therein, a T-shaped stylus-bar having its vertical arm connected to the diaphragm, a stud, i^2 , extending under one end of the stylus-bar, a knife-

edge carried by the lower side of the stylus-
bar adapted to a V-shaped groove in the stud,
a stud, h^2 , located above the other end of the
stylus-arm, a knife-edge carried by the upper
5 side of the stylus-bar adapted to a V-shaped
groove provided in the stud, a cord, G, se-
cured to the stylus-bar passing over the end
of same and under the stud, i^2 , said cord pass-
ing through an eye formed in the opposite
10 end of the stylus-bar and passing upwardly
against the stud, h^2 , a coiled spring secured

to the upper end of the cord, an arm, L, car-
ried by the sound-box frame supporting the
coiled spring at its free end, and a set-screw,
Z, for adjusting the said arm, substantially as 15
described.

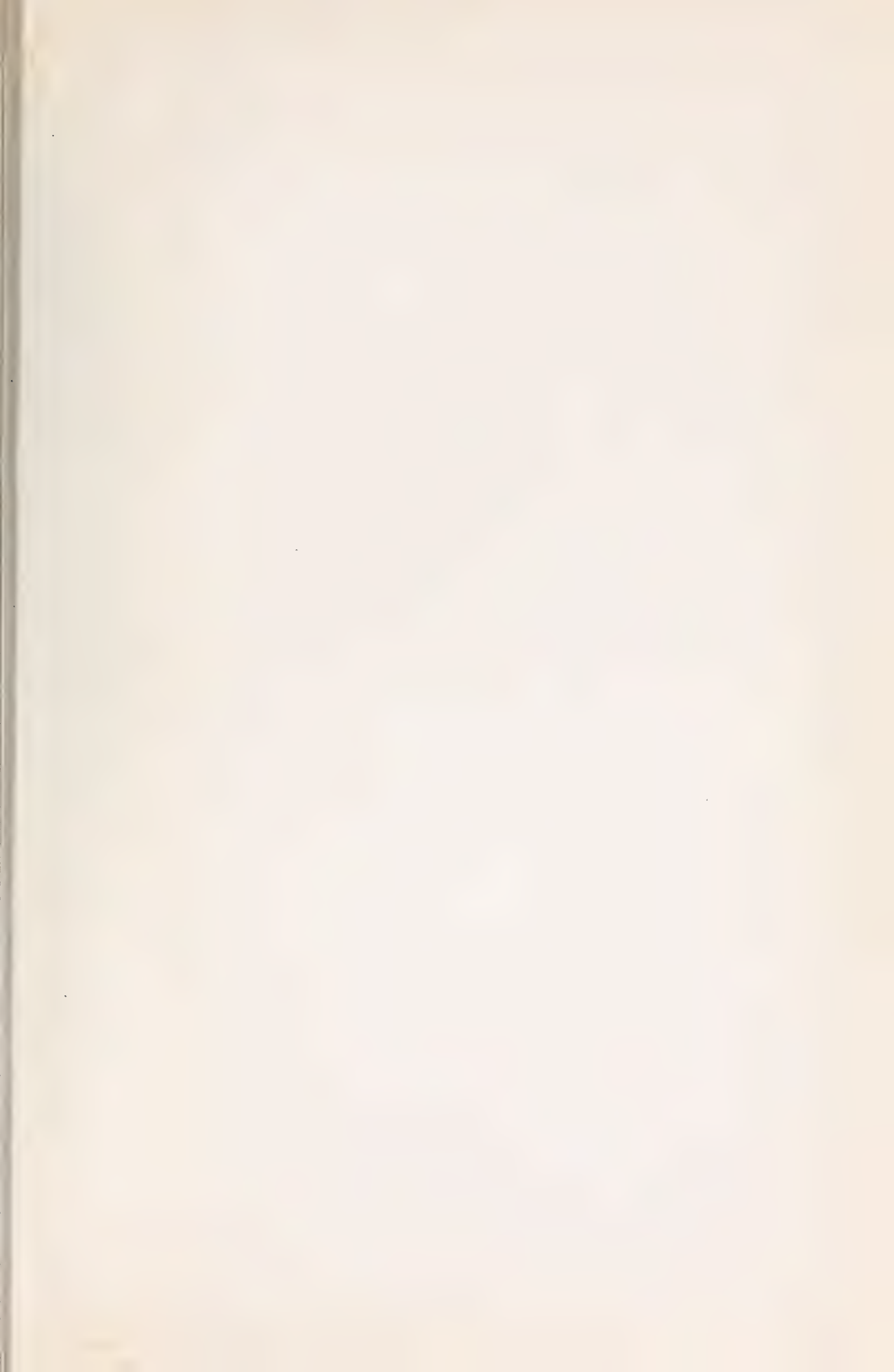
In witness whereof I have hereunto set my
hand this 3d day of August, A. D. 1900.

ELDRIDGE R. JOHNSON.

Witnesses:

JNO. T. CROSS,

LEWIS H. VAN DUSEN.





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